DESIGN OF A SEWERAGE SYSTEM FOR HOMEWOOD, ILLINOIS

BY

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ARMOUR INSTITUTE OF TECHNOLOGY

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DESIGN OF A SANITARY SEWERAGE SYSTEM AND DISPOSAL PLANT FOR HOMEWOOD ILLINOIS

A THESIS

PRESENTED BY

E. DASING
I. M. ENGH
C. L. GOLD
M. E. SHAW

TO THE

PRESIDENT AND FACULTY

OF

ARMOUR INSTITUTE OF TECHNOLOGY

FOR THE DEGREE OF

BACHELOR OF SCIENCE

IN

CIVIL ENGINEERING

MAY 29, 1919

APPROVED

Alfred E. Phillips
Professor of Civil Engineering

HMR
Dean of Engineering Studies

Dean of Cultural Studies

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TABLE OF CONTENTS.

Page No.

Bibliography, - - - - - - - - - - 1.
Object, - - - - - - - - - - - - - 2.
Introduction, - - - - - - - - - - 4.
The Village of Homewood, - - - - - 7.
Design of Sewer System, - - - - - 9.
Design of Sewage Settling Tanks, - 14.
Design of Sludge Drying Bed, - - - 19.
List of Drawings, - - - - - - - - 20.

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Pamphlet by Pacific Flush Tank Co.

OBJECT.

In presenting to the faculty of Armour Institute of Technology, a thesis, the authors feel that it is necessary to offer some sort of an apology for it's appearance. Moreover, there is in this case a good reason for beginning this thesis with ah apology, because of the liberty which we are taking, in imposing upon the good nature of the faculty, by asking it's members to read still another thesis upon the already overwritten subject of Sanitary Sewer Systems.

But to speak seriously, if this work were a mere rehash of other thesises, the authors would not presume to present it to the President and Faculty of the Armour Institute of Technology; but, on the contrary, in writing it we have endeavored to make the contents as original as possible, and to treat essentially of the fundameatal principles of sewer design and their application. Furthermore, we have selected a

town in which there is no sewer system at the present time, and to the knowledge of the authors there has never been any survey made, with this object in view. All data and profile notes were obtained in the field by the authors themselves.

In conclusion, the authors desire to acknowledge with many thanks their indebtedness to Prof. Alfred E. Phillips, Prof. John C. Penn, and Mrs. Julia Beveridge for valuable aid rendered in the preparation of this thesis. The authors wish to take this opportunity to thank Mr. F. H. Gold, father of one of the authors, for furnishing them with a plat of the village and for the many favors extended to the authors by him while carrying on their survey in the village. The authors also wish to thank Mr. Julian Frank, a Junior at the Armour Institute of Technology, for assisting us in the field on several occasions, and to Mr. P. H. Houston, Resident Engineer, Illinois Central Railroad, at Homewood, for advice and aid in the field.

Chicago, Illinois. - May. 19, 1919.

INTRODUCTION.

The development of design of sewer systems in America owes much to the system so long in vogue of bidding on competitive plans, in that such compitition has tended to sharpen the wits of engineers of competing companies, it is equally true that the said competition has done all the good it can for the science of sewer designing, and now acts as a clog to prevent it's further advancement.

As men in general are working for the almighty dollar, and as human nature is the same the world over, it stands to reason that a contractor's engineer in preparing upon fixed specifications a design to be used as a basis for competitive bid and when he knows that the contract will be awarded to the lowest bidder whose design conforms to letter of the specifications, although it may not be up to the requirements of good engineering practice, he will take advantage of every weak point and omission in said specifications, even if his

engineer's conscience proclaims the design he submits to be worse than faulty.

In the preparation of this thesis, it is needless to say that the authors have not been predjudiced or influenced in their design by this old custom of competitive bids. We have endeavored to adhere to good principles of design, and any violation of any one of them is a mistake that will be regretted, and will be done unconsciously. In spite of all the care that the most expert designers can give their work, errors of greater or less magnitude will creep in occasionally and one can always improve somewhat upon any finished design, Such being the case, it follows that the designing of sanitary sewer systems should be intrusted to expert and disinterested designers only.

In looking for a thesis subject, for submission for final degree at the Armour Institute of Technology, the authors wanted a subject which would not only require original investigation, but which would also be of a practical value. The initial step was the selection of a village

in the vicinity of Chicago which lacked a sewer system, and hence, Homewood, Illinois was selected.

A plat of the village was furnished by Mr. Gold, and from this a new plat was made, to a different scale, making all changes and new location of streets to date.

THE VILLAGE OF HOMEWOOD.

The village of Homewood is located in Cook County, Illinois. It is about twenty five miles from Chicago, and it may be reached by the Illinois Central Railroad from the Illinois Central Depot.

The Dixie Highway traverses the main section of the village. The topography of the country is of a fairly uniform slope in a north eastern direction. The elevation in the south west portion is about eighty feet and in the north east portion about forty five feet, so that the difference is approximately thirty five feet. The geological formation is generally of limestone but various kinds of sand formation may be encountered at various places. The surface formation is mostly cultivated soil.

The inhabitants of the village are mostly of a residential nature, having their places of business and occupation in the cities of Chicago, and Harvey. The inhabitants as a whole are fairly progressive, taking a great deal of

pride in their home town, and what public improvements they have constructed, they were carefully maintained. The present population is estimated to be about 1600, and it increases at a rate of 100 per year.

DESIGN OF SEWER SYSTEM.

In preparing the design of a sewer system, the first matter to be decided is, What system - separate or combined, shall be employed. The second, how much and what kinds of sewage must be provided for. The third, what disposal shall be made of it.

The first question; what system - separate or combined, shall be employed. In the authors' opinion, and that of eminent and leading sanitary engineers, the separate system is always preferable. New Orleans and Baltimore, the only large cities that have built complete sewerage systems during the past twenty five years, are both sewered on the separate system; the sewerage for the new parts of New York City is planned to be a separate system;,most combined sewers built recently being extensions of existing combined systems. The second question; how much and what kinds of sewage must be provided for. Since the population of the Village of Homewood is of a residential nature, over

ninety five percent of the sewage will be domestic sewage. The amount of sewage per capita per day was estimated at 150 gallons, and each city lot of 50 feet was considered as having five inhabitants on it. In deciding upon the third question, what disposal shall be made of it; the method of disposal by dilution was eliminated immeadiatly because of not having a large water supply at hand. The method decided upon for disposal was the rectangular horizontal flow type of Imhoff settling tanks. This method was more suitable and better adapted to the local conditions.

In determining the size of pipe, not only the inhabited sections were taken care of, but also those outlying sections which as yet are not subdevided. Since the center of the streets are not occupied by gas, or water mains, nor a street railroad, the trunk lines are located in the centers of streets or alleys, thus making the cost for house - connections on each side of the street equal for each property owner.

This also permits the minimum depth of sewer for the houses are, generally, at equal elevations on both sides of the street. The minimum size pipe is 8 inch, for the main line, as this is the prevailing practice in this country, and "Y" connections are all of 4 inch pipe. A 4-inch house connection is ample for any building containing less than 50 persons and which contributes only ordinary house sewage.

When possible, the grades of the various sewers were so proportioned that the velocity of the sewage shall increase as the outlet is approached, or at least it was not allowed to decrease, since a decrease in velocity is liable to cause a deposit of suspended matter. The minimum grade decided upon was 0.3% and the maximum grade was 2.0%. The minimum velocity would not drop below 2 feet per second and the maximum would not exceed 3 feet per second.

The minimum depth of sewers is decided usually by local circumstances or practice. It is generally desirable to lay them somewhat

deeper than gas or water pipes, that these may not interfere with them. It is customary in this part of the country to make 6 feet the least depth which should be given to the flow line except under exceptional conditions. Therefore the authors adopted this depth as the minimum depth of sewers. When the depth is considerable, the expense of making house connections may become excessive. It is good engineering practice to keep the maximum depth about 14 to 16 feet, since depths below this would make the cost of construction increase rapidly, however, owing to the irregular and somewhat hilly topography of the village of Homewood, depths of 20 and 22 feet have been used at times.

Flushing of sewers will be accomplished by means of fire hose tapped to fire hydrants, and carried to the different manholes. Flush tanks are very costly to build and expensive to operate. Many authorities doubt that they accomplish the purpose for which they are built

and designed, because they are efficient only for a distance of 100 feet. The constant maintenance and inspection did not warrent their adoption in a problem of this nature.

The width at the bottom of a trench for 8-inch pipe is 24 inches, and for 10 to 14-inch pipe, thirty inches. A two-foot trench is the narrowest that a man can work in with sufficient ease and comfort.

Manholes will be of standard brick construction. The diameter will be 4 feet, tapering to 2-ft.-6-inches, at the top, and capped with a standard 350-lb. cast iron manhole cover.

DESIGN OF SEWAGE SETTLING TANKS.

First to be considered in the design of any disposal plant is, the question of whether the sewerage system is constructed on the combined, or the separate plan. Since the design of the sewerage system in this problem was the separate system, the amount of sludge coming to the sludge chamber would not be as great as from the combined system. Hence, with this system the sludge-room capacity is lessened.

The next factor that is considered in the design of the plant is, the amount and character of the sewage. The character of the sewage affects greatly the time necessary for sedimentation. The sewage of a village like Homewood, is of such character that a retention of the sewage for three hours was warrented. Since the intermittant flow method of sewage to the settling tanks was adopted, two tanks had to be designed. The volume of these tanks necessary to take care of the daily sewage was

based on the consumption of 150 gallons per capita per day. For a population of 2000 persons, the required daily capacity of the tanks would be 300,000 gallons. The chambers of each tank were designed to care for a reasonable number of gallons more per day than the estimated amount, so that any over-taxation of the tanks could be taken care of. The rectangular - horizontal flow type of Imhoff settling tanks was adopted because it seemed to suit the local conditions best.

The length of the tanks is 50 feet. With the length determined, the previously determined necessary tank volume, will give the necessary cross section. The width and depth was determined and found to be fifteen and twenty feet respectively. These dimensions, with the proper capacity for the detention period of three hours, in the opinion of the authors, will give satisfactory results. The shallow depth of the tank was determined because the

inlet to the tank is seven feet below the ground level. It was necessary to construct a retaining wall from the top of the settling tanks to the earth's surface.

The size of the sludge storage chamber is dependent upon the population that is to be served, upon the character of the sewerage system, and upon the operation requirements. The storage room is one of the most vital parts of an Imhoff plant. Throughout the United States, it has been found with only few exceptions, that the amount of sludge discharged from the Imhoff tanks is 0.0035 cubic feet per inhabitant per day, for the separate system. This amounts to approximately 2600 cubic feet of sludge to be taken care of by the storage room for one year for a population of 2000 inhabitants. The sludge room is designed to be emptied once a year.

The inlet and outlet lines are set at the same elevation, and the direction of flow in the channels is regulated and controlled by

means of shear valves. Since the sludge chamber is designed as two compartments, the periodical reversion of flow is considered necessary for an equal distribution of sludge in the two compartments.

The bottom of the channel is designed circular so as to give better means of inspection.

Cast iron sludge pipes and bronze mounted valve gates with notched handles, are used in the design of the sludge removing end. The sludge is to be removed from it's chamber by ten feet of head (static pressure) into a sump where the sludge will be pumped out again into a sludge drying bed.

The tanks are to be constructed of standard reinforced concrete of a 1:2:4 mixture with 0.5% of steel rods. The authors used a thickness of 18 inches throughout for the walls and reinforced with 3/4 inch round rods spaced at 6-inch centers with 1/2 inch round tie rods at 12-inch centers. The bottom of the tank is

thoroughly reinforced with 3/4 inch round rods arranged in layers.

In order to make the tank and channels water proof, a coat of neat Portland cement about 1/4 inch thick on the interior surface is specified.

DESIGN OF SLUDGE DRYING BED.

The size of the drying bed depends upon the population to be served. The size of the beds are designed for the ultimate capacity of the two tanks, and for this problem, found to be 20 by 42 feet.

The stratification of the filtering medium consists of four layers; the total depth being 15 inches. The drying beds are designed for the removal of the contents every two years.

LIST OF DRAWINGS.

Topographical Map.

Plan of Sewer System.

Computation Chart of Sewer System.

Eighteen Profile Sheets.

Detail of Manhole.

Layout of Disposal Plant.

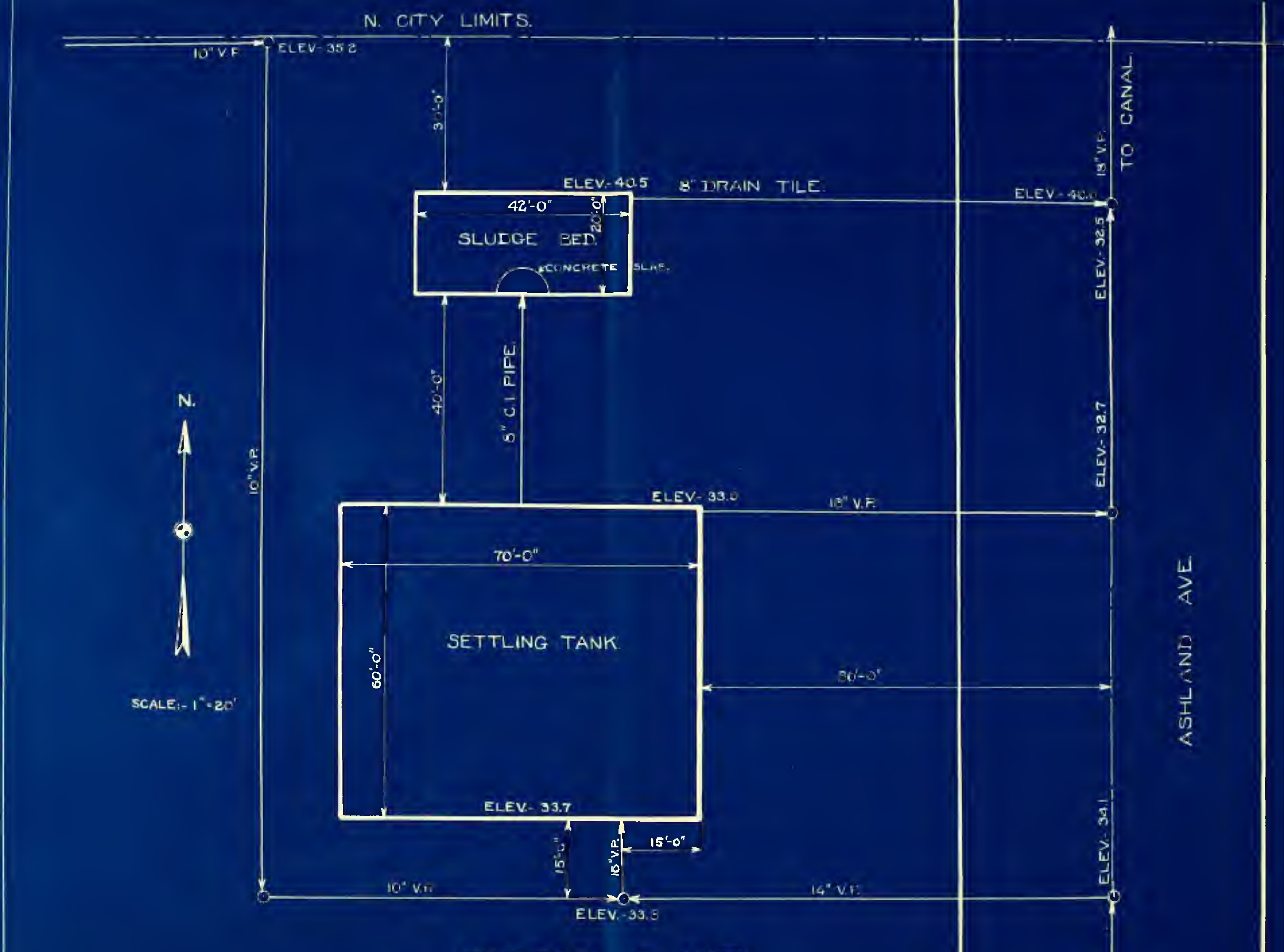
Design of Settling Tank.

Design of Sludge Drying Bed.

SANITARY SEWERAGE SYSTEM FOR THE VILLAGE OF HOMEWOOD, ILL.

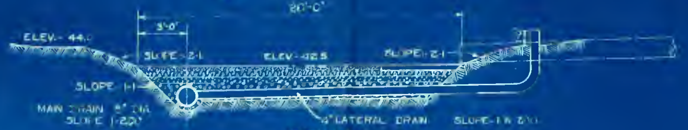
PROFILE PAGE.	STREET.	HIGH.		LOW.		FALL IN FEET.	LENGTH IN FEET.	GRADE.	QUANTITY CU.FT./MIN.	ACCUMULATIVE TOTAL	DIAMETER IN INCHES.	LEN. IN FT. OF HOUSE DRAINS-10' FROM-LOT-LINE	AVERAGE CUT IN FEET.	WIDTH OF TRENCH IN INCHES	EXCAVATION IN CU. YDS.	MANHOLES.	DROP MANHOLES.	✕ CONNECTIONS.	CU.FT./MIN. UNSEWERED PROPERTY.
		FROM.	ELEV.	TO.	ELEV.														
2	ALLEY BET. HENRY & KLIMM.	WILLIAM.	70.0	ALLEY.	68.5	1.5	440	.003	0.623	0.623	8	90	8.1	24	319	2		9	
2	ALLEY " WILLIAMS & MARIA.	ALLEY	68.5	KLIMM.	68.1	0.4	190	.003	0.000	0.623	8	0	9.6	24	127	1		0	
6	KLIMM	WILLIAM.	70.0	ALLEY.	68.1	1.9	470	.004	1.246	1.246	8	360	9.6	24	590	3		18	
6	"	ALLEY.	68.1	MARIA.	67.5	0.6	160	.003	0.416	1.869	8	0	11.6	24	116	1		0	
1	MORRIS.	WILLIAMS	69.0	"	66.3	2.7	630	.004	1.662	1.662	8	360	9.9	24	734	3		18	
1	MARTIN.	"	72.1	"	69.4	2.7	630	.004	1.662	1.662	8	360	10.5	24	772	3		18	
3	VINCENNES.	"	75.7	RIEDLE.	72.9	2.8	440	.003	0.623	0.623	8	100	8.7	24	348	2		10	
4	RIEDLE.	GOTTSCHALK.	76.5	VINCENNES.	73.9	2.6	635	.004	1.815	1.815	8	320	6.7	24	474	2		16	
3	VINCENNES.	RIEDLE.	72.9	MARIA.	72.5	0.4	190	.004	0.278	2.716	8	50	7.6	24	675	1		5	
5	MARIA.	GOTTSCHALK.	77.7	VINCENNES.	72.5	5.2	635	.008	1.845	1.845	8	460	8.2	24	968	1		20	
5	"	VINCENNES.	72.5	MARTIN.	69.4	3.1	390	.008	1.112	5.673	8	253	8.2	24	390	0		11	
5	"	MARTIN.	69.4	MORRIS.	66.3	3.1	390	.008	1.112	6.785	8	253	8.2	24	390	0		11	
5	"	HENRY.	68.0	KLIMM.	67.5	0.5	180	.003	0.556	0.556	8	154	8.2	24	206	1		7	
5	"	KLIMM.	67.5	MORRIS.	66.3	1.2	390	.003	0.958	3.383	8	276	8.2	24	404	0		12	
1	MORRIS.	MARIA.	66.3	KLIMM.	63.7	2.6	750	.003	2.085	12.153	8	340	12.9	24	1042	3		17	
6	KLIMM.	"	69.9	MORRIS.	63.7	6.2	150	.005	1.042	1.042	8	380	9.3	24	778	4		19	
1	MORRIS.	KLIMM.	63.7	RAILROAD.	62.3	1.4	530	.003	1.530	14.725	8	440	13.0	24	935	1		22	
1	"	RAILROAD.	62.3	CLARK.	57.2	5.1	830	.006	1.180	15.905	8	135	16.5	24	1180	1	1	9	
7	WALNUT.	MAPLE.	70.0	CEDAR.	65.8	4.2	500	.008	1.390	1.390	8	400	8.5	24	566	3		20	
15	CEDAR.	GOLF.	70.0	WALNUT.	65.8	4.2	645	.006	1.808	1.808	8	500	9.1	24	780	2		25	
7	WALNUT.	CEDAR.	65.8	PINE.	61.6	4.2	520	.008	1.530	4.728	8	100	8.5	24	381	2		20	
10	PINE.	WALNUT.	61.6	ASH.	60.7	0.9	300	.003	0.418	5.146	8	50	7.8	24	220	1		10	
10	PINE.	ALLEY-200'-W-OF-PARK.	63.1	ASH.	60.7	2.4	160	.010	0.209	0.209	8	30	9.2	24	123	1		6	
10	ASH.	PINE.	60.7	CLARK.	59.8	0.9	330	.003	0.972	6.327	8	80	8.3	24	252	1		4	
10	CLARK.	WALNUT.	61.3	ASH.	59.8	1.5	190	.010	0.556	0.556	8	120	10.8	24	248	1		6	
10	"	ASH.	59.8	PARK.	58.3	1.5	360	.003	0.971	7.854	8	140	15.8	24	585	1		7	
9	PARK.	RAILROAD.	61.2	OAK.	60.8	0.4	270	.003	0.348	0.348	8	75	10.8	24	276	2		5	
11	OAK.	WALNUT.	63.0	PARK.	60.8	1.2	260	.010	0.696	0.696	8	60	10.5	24	249	1		3	
9	PARK.	OAK.	60.8	MAIN.	59.4	1.4	360	.003	0.486	1.530	8	90	14.8	24	493	1		6	
11	MAIN.	WALNUT.	62.4	PARK.	59.4	3.0	380	.010	1.112	1.112	8	180	11.5	24	476	1		9	
9	PARK.	MAIN.	59.4	CLARK.	58.3	1.1	360	.003	0.486	3.128	8	90	19.6	24	654	0		6	
9	"	PINE.	59.5	"	58.3	1.2	430	.003	0.625	0.625	8	24	15.6	24	525	2		8	
12	CLARK.	PARK.	58.3	MORRIS.	57.2	1.1	350	.003	10.982	10.982	8	0	18.1	24	469	0		0	
1	MORRIS.	ELM.	66.3	CLARK.	57.2	9.1	320	.003	0.417	0.417	8	120	9.0	24	294	1		6	
12	CLARK	MORRIS.	57.2	MARTIN.	56.0	1.2	360	.003	0.972	28.276	8	120	18.1	24	643	1		6	
1	MARTIN.	MARIA.	71.0	MARY.	69.0	2.0	610	.003	1.670	1.670	8	280	9.2	24	606	3		14	
6	MARY.	MORRIS.	70.1	MARTIN.	69.0	1.1	365	.003	1.040	1.040	8	160	10.8	24	386	1		8	
6	"	VINCENNES.	70.0	"	69.0	1.0	370	.003	1.040	1.040	8	60	10.8	24	424	1		8	
1	MARTIN.	MARY.	69.0	MAIN.	66.1	2.9	690	.003	1.875	5.625	8	360	12.8	24	1000	3		18	
13	MAIN.	MORRIS.	69.8	MARTIN.	66.1	3.7	330	.010	0.971	0.971	8	120	14.5	24	483	1		6	
13	"	VINCENNES.	69.0	"	66.1	2.9	320	.010	0.844	0.844	8	120	13.1	24	428	1		6	
1	MARTIN.	MAIN	66.1	CLARK.	65.0	1.1	365	.003	0.972	8.412	8	80	12.1	24	399	0		4	
12	CLARK.	MARTIN.	56.0	VINCENNES.	55.6	0.4	150	.003	0.407	37.095	10	20	18.1	30	284	0		1	
3	VINCENNES.	MAIN.	70.0	CLARK.	55.6	14.4	730	.010	1.041	1.041	8	120	9.0	24	567	0	1	6	
3	"	CLARK.	55.6	ELM.	54.4	1.2	325	.003	0.972	39.108	10	50	16.5	30	573	1		5	
1	MORRIS.	I.C.R.R. SUBWAY.	56.0	"	55.4	0.6	200	.003	0.278	0.278	8	80	10.1	24	210	1		4	
13	ELM.	MORRIS.	55.4	VINCENNES.	54.4	1.0	340	.003	0.972	1.250	8	120	16.8	24	572	1		6	
3	VINCENNES.	ELM.	54.4	PINE.	52.8	1.6	570	.003	0.764	41.122	10	70	16.6	30	1338	0		17	
3	E. SIDE OF VINCENNES.	MAIN.	70.0	"	52.8	17.2	1390	.005	1.875	1.875	8	520	6.5	24	896	4		26	
11	PINE.	VINCENNES.	52.8	GOTTSCHALK.	49.3	3.4	530	.006	1.530	44.527	10	340	16.6	30	1338	0		17	
15	GOTTSCHALK.	MAIN.	61.0	1000'-S. OF PINE.	58.0	3.0	320	.010	0.972	0.972	8	120	6.2	24	202	2		6	
15	"	1000'-S. OF PINE.	58.0	PINE.	55.0	3.0	1000	.003	2.780	3.752	8	60	12.0	24	941	2	1	30	
11	PINE.	GOTTSCHALK.	49.3	HOMEWOOD.	47.7	1.6	500	.003	1.390	49.669	10	340	15.8	30	1228	1		17	
14	HOMEWOOD.	MAIN.	68.0	PINE.	61.0	7.0	1320	.010	3.750	3.750	8	760	11.6	24	1788	4		38	
11	PINE.	HOMEWOOD.	47.7	RIDGE.	46.8	0.9	340	.010	0.972	54.391	10	220	15.0	30	777	1		11	
4	RIEDLE.	GOTTSCHALK.	76.5	HIGHLAND.	66.0	10.5	740	.015	2.085	2.085	8	520	7.4	24	1430	2		26	
12	HIGHLAND.	RIEDLE.	66.0	MARIA.	60.0	6.0	360	.020	0.972	3.057	8	0	7.2	24	192	1		0	
5	MARIA.	GOTTSCHALK.	77.7	HOMEWOOD.	73.2	4.5	670	.015	1.808	1.808	8	500	8.9	24	772	1	1	25	
5	"	HOMEWOOD.	64.0	HIGHLAND.	60.0	4.0	710	.010	1.945	3.753	8	520	8.0	24	728	2		26	
5	"	ASHLAND.	67.9	"	60.0	7.9	1290	.006	3.620	3.620	8	480	8.3	24	1088	5		24	
12	HIGHLAND.	MARIA.	60.0	OLIVE.	57.9	2.1	730	.003	2.085	12.515	8	360	11.3	24	913	1	1	18	
2	OLIVE.	ASHLAND.	60.0	500'-W-OF ASHLAND.	55.0	5.0	500	.010	1.390	1.390	8	400	9.3	24	620	3		20	
2	"	500'-W-OF ASHLAND.	55.0	HIGHLAND.	53.4	1.6	790	.003	2.215	3.605	8	600	13.3	24	1380	1		30	
12	HIGHLAND.	OLIVE.	53.4	MAIN.	51.0	2.4	780	.003	1.250	17.370	8	440	14.6	24	1320	2		22	
3	VINCENNES. (BOTH SIDES.)	MARIA.	73.0	"	70.4	2.6	2900	.003	4.030	4.030	8	800	9.3	24	1440	12		40	
13	MAIN.	VINCENNES.	70.4	HIGHLAND.	51.0	19.4	1340	.014	3.750	13.390	8	900	9.1	24	1512	2		45	5.56
13	"	ASHLAND.	55.0	"	51.0	4.0	1290	.003	3.620	3.620	8	960	9.0	24	1500	5		48	
12	HIGHLAND. (EXTENDED.)	MAIN.	51.0	PINE.	46.8	4.2	1360	.003	3.750	38.080	8	720	11.7	24	1804	3		36	
16	MAPLE.	RIDGE.	57.5	MORRIS.	51.0	6.5	1070	.010	2.990	2.990	8	800	7.1	24	985	3		40	
1	MORRIS.	MAPLE.	51.0	CEDAR.	49.0	2.0	595	.003	1.670	4.660	8	40	9.9	24	468	2		2	
16	CEDAR.	MORRIS.	49.0	RIDGE.	46.0	3.0	1320	.003	3.682	8.342	8	700	14.9	24	2232	3		35	
16	"	200'-W-OF FORREST.	62.0	400'-W-OF FORREST.	58.5	3.5	200	.018	0.278	0.278	8	80	10.0	24	208	1		8	
16	"	400' " " "	48.2	RIDGE.	46.0	2.2	150	.010	0.556	0.834	8	160	15.5	24	345	0	1	18	
12	RIDGE.	CEDAR.	46.0	PINE.	44.5	1.6	510	.003	1.390	10.566	8	80	15.9	24	694	0		4	
11	PINE.	RIDGE.	44.5	ASHLAND.	40.6	3.9	1200	.003	3.640	106.677	12	880	25.6	30	4930	3		44	
17	ASHLAND.	PINE.	40.6	CEDAR.	39.1	1.5	510	.003	3.640	118.657	14	160	21.0	30	1802	0	1	8	8.35
16	CEDAR.	200'-W-OF FORREST.	62.0	ASHLAND.	48.4	13.6	900	.012	2.500	2.500	8	560	9.5	24	1028	1		28	
17	ASHLAND.	CEDAR.	39.1	MAPLE.	37.6	1.5	555	.003	1.520	122.677	14	50	9.2	30	516	1		10	
16	MAPLE.	RIDGE.	58.0	150'-E-OF RIDGE.	55.0	3.0	150	.020	0.417	0.417	8	120	8.6	24	172	1	1	6	
16	"	150'-E-OF RIDGE.	45.7	FORREST.	41.2	4.5	475	.010	1.320	1.737	8	360	9.4	24	580	1		18	
16	"	FORREST.	41.2	ASHLAND.	37.6	3.6	690	.005	1.945	3.682	8	400	6.5	24	526	1		20	
17	ASHLAND.	MAPLE.	37.6	DISPOSAL PLANT.	34.1	3.5	1150	.003	3.200	134.979	14	115	8.2	30	3960	7		23	5.56
13	ALLEY-50'-W-OF PARK.	PINE.	65.5	CEDAR.	60.0	5.5	540	.010	0.765	0.765	8	80	8.8	24	404	2		10	
15	CEDAR.	WALNUT.	66.0	ALLEY-200'-W-OF PARK.	60.0	6.0	710	.006	1.945	1.945	8	660	7.5	24	760	3		33	
15	"	ALLEY-200'-W-OF PARK.	60.0	PARK.	59.0	1.0	180	.005	0.486	2.710	8	45	9.1	24	152	1		3	
9	PARK.	CEDAR.	59.0	MAPLE.	56.0	3.0	570	.005	1.600	4.655	8	240	12.1	24	726	2		12	
7	GOLF.	"	72.1	"	70.5	1.6	530	.003	1.458	1.458	8	400	8.1	24	557	3		20	
8	MAPLE.	GOLF	70.5	WALNUT.	66.5	4.0	660	.006	1.875	1.875	8	480	8.2	24	693	3		24	
8	"	WALNUT.	66.5	200'-E-OF PARK.	57.0	9.5	950	.024	2.660	4.535	8	720	10.9	24	1350	2		36	
8	"	200'-E-OF PARK.	57.0	PARK.	56.0	1.0	200	.005	0.556	5.091	8	80	8.4	24	174	1		8	
9	PARK.	MAPLE.	56.0	WESTERN.	50.5	5.5	1130	.005	1.600	22.466	8	220	9.4	24	940	3		22	
9	"	WESTERN.	50.5	N. VILLAGE LIMTS.	41.5	9.0	640	.015	0.904	27.930	8	240	6.4	24	417	2		12	10.82
18	N. VILLAGE LIMITS.	PARK.	41.5	DISPOSAL PLANT.	35.2	6.3	2100	.003	6.116	37.606	10	0	6.9	30	0			0	5.56
	ASHLAND.	DISPOSAL PLANT.	35.2	171ST ST.	32.7	2.5	2640	.001		172.585	18		5.0	30	1222	7			
	171ST ST.	ASHLAND.	32.7	CANAL.	30.2	2.5	2640	.001		172.585	18		5.0	30	1222	7			

"TABLE OF ESTIMATES."
ARMOUR INSTITUTE OF TECHNOLOGY.
-MAY- THESIS OF: -1919-
-EMIL DASING-I.M.ENGH.-C.L.GOLD-M.E.SHAW-

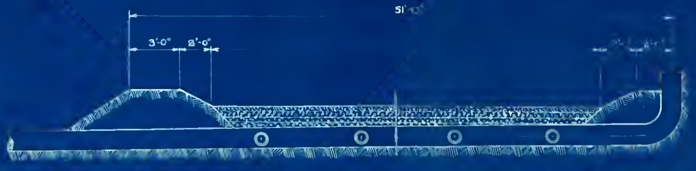


DISPOSAL PLANT.

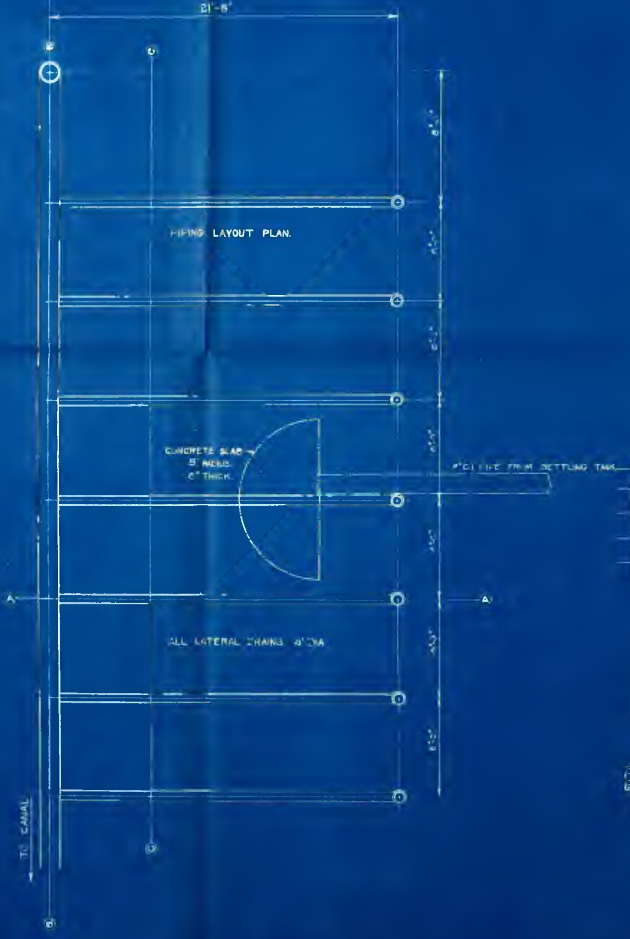
MAY 1919.

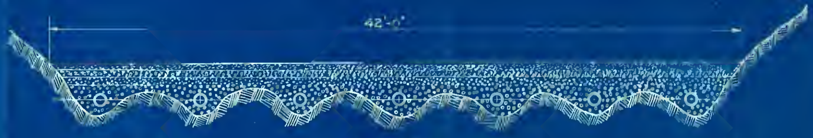


SECTION A-A



SECTION B-B


21'-8"
PIPING LAYOUT PLAN.
CONCRETE SLAB 5' RADIUS 6" THICK.
6" C.I. PIPE FROM SETTLING TANK
A
A
ALL LATERAL DRAINS 4" DIA
TO CANAL



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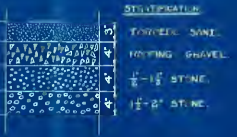

SLUDGE DRYING BED

SCALE:- 1/4" = 1'

MAY 1919.

METHOD OF CONNECTION.

DESIGN
OF A
SANITARY SEWER SYSTEM
FOR
THE VILLAGE OF HOMEWOOD, ILL.
A THESIS
PRESENTED FOR THE DEGREE OF
BACHELOR OF SCIENCE
IN CIVIL ENGINEERING
SUBMITTED BY
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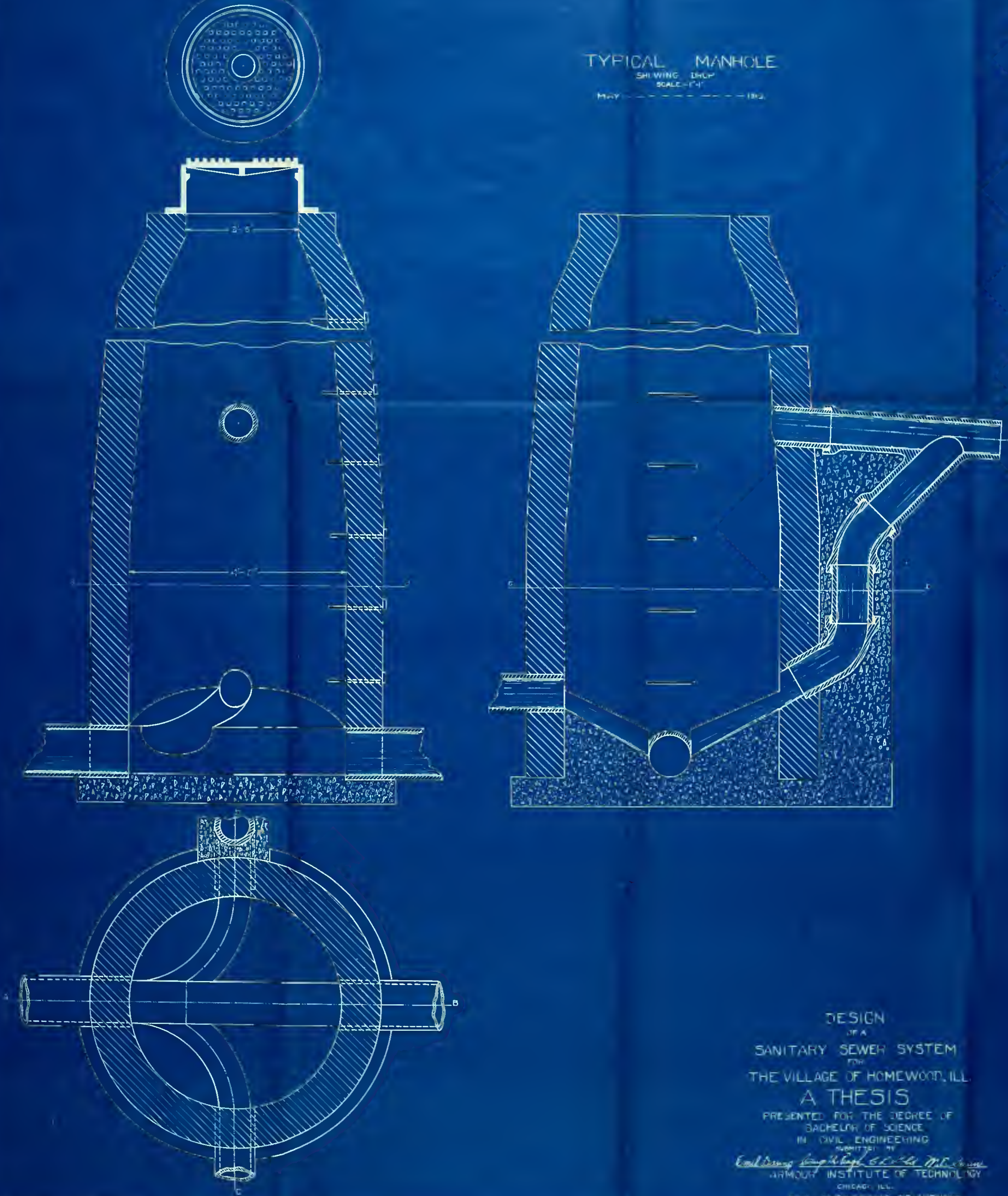
CHICAGO, ILL.
CIVIL ENGINEERING DEPARTMENT.

TYPICAL MANHOLE

SHOWING DROP

SCALE — 1" = 1'

MAY — — — — — — — — 1912.



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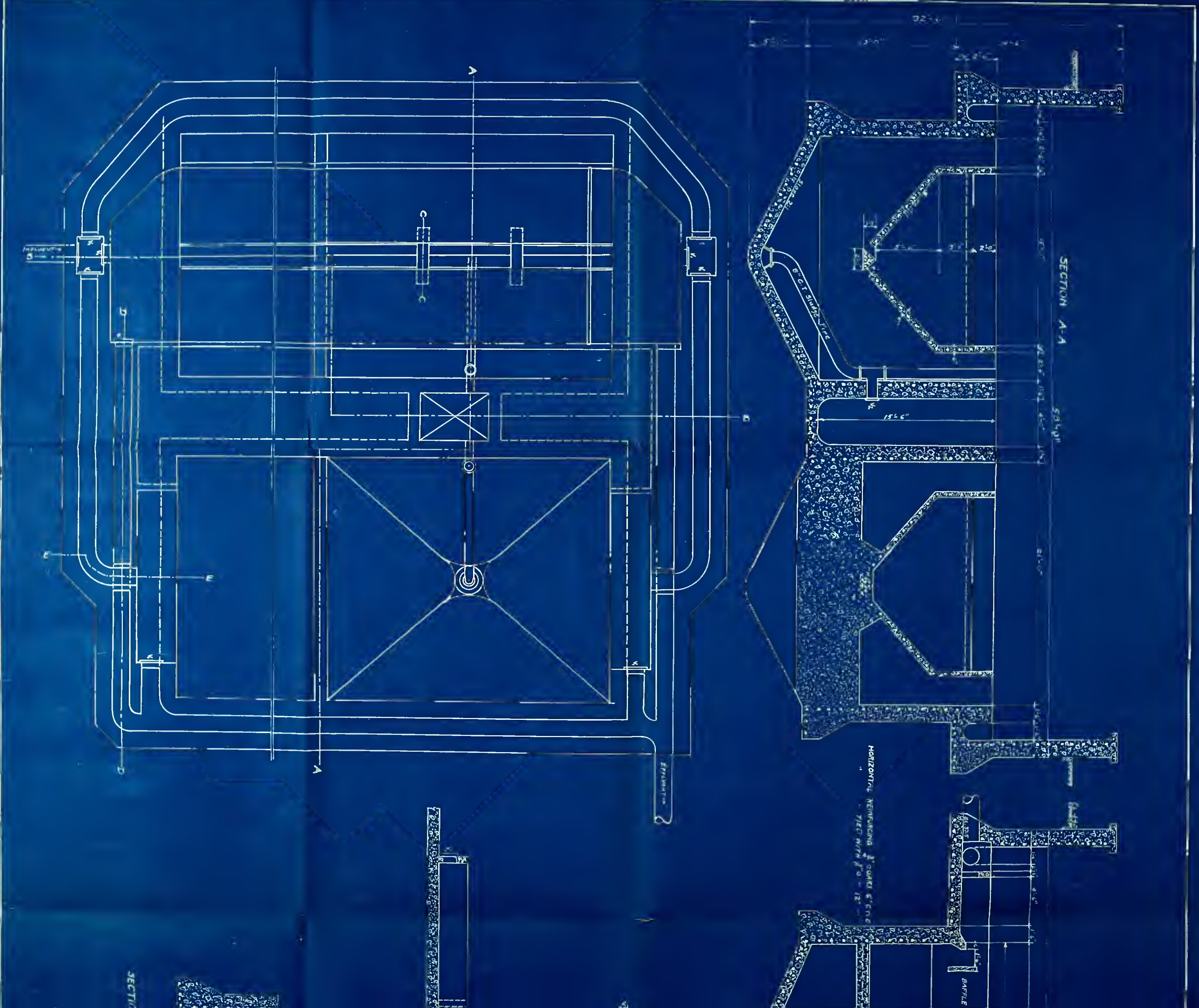
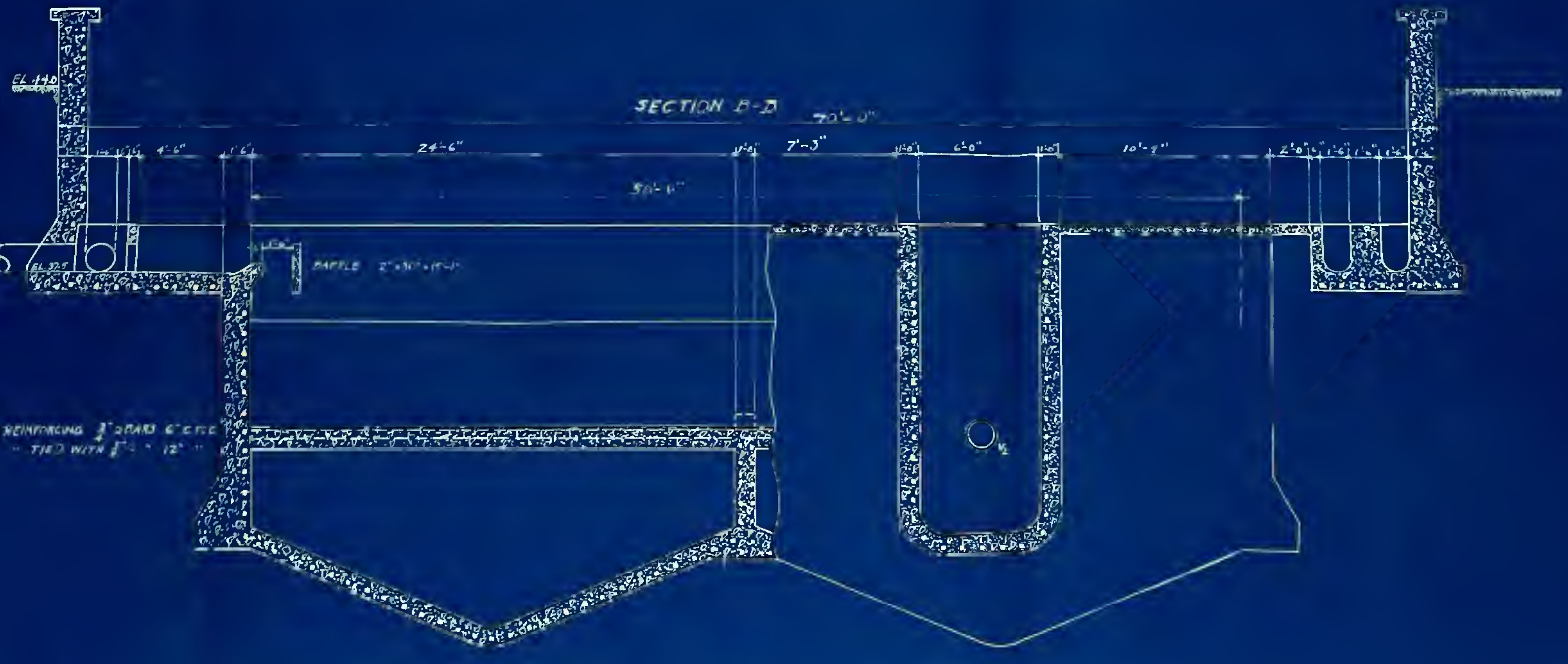
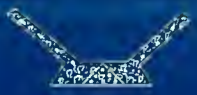
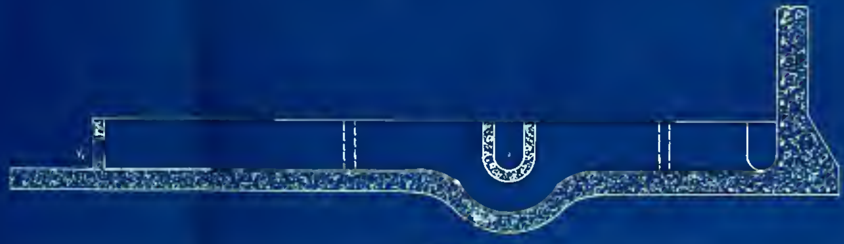

92'-6"
2'-0"
15'-6"
58'-9"
SECTION A-A
8" C.I. Sludge Pipe
Slope 1:2
INFLUENT
EFFLUENT
A
B
C
D
E
HORIZONTAL REINFORCING 1/2" SQUARE 6" C. to C.
TIED WITH 3/8" ϕ – 12" –
BAFFLE
SECTI



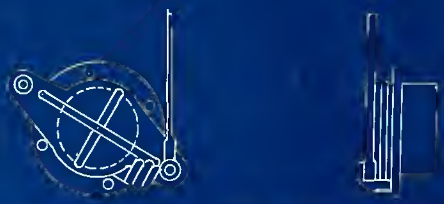
SECTION B-B



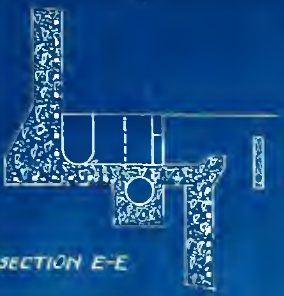
SECTION C-C



SECTION D-D



CHAPMAN SHEAR GATE VALVE.
8" 10" VALVES MARK V₁
4 0" " " V₂



SECTION E-E

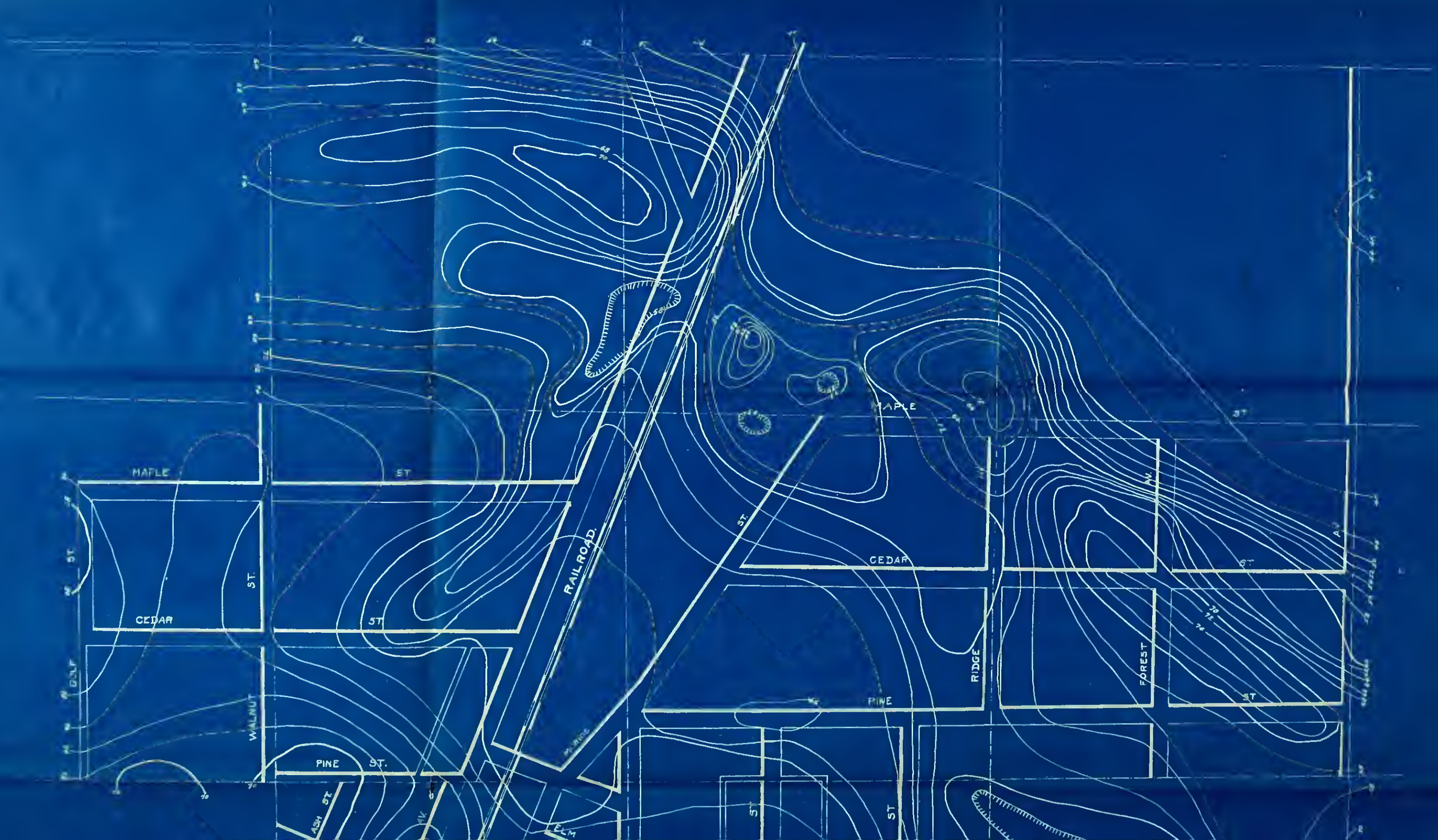
SEWAGE SETTLING TANKS

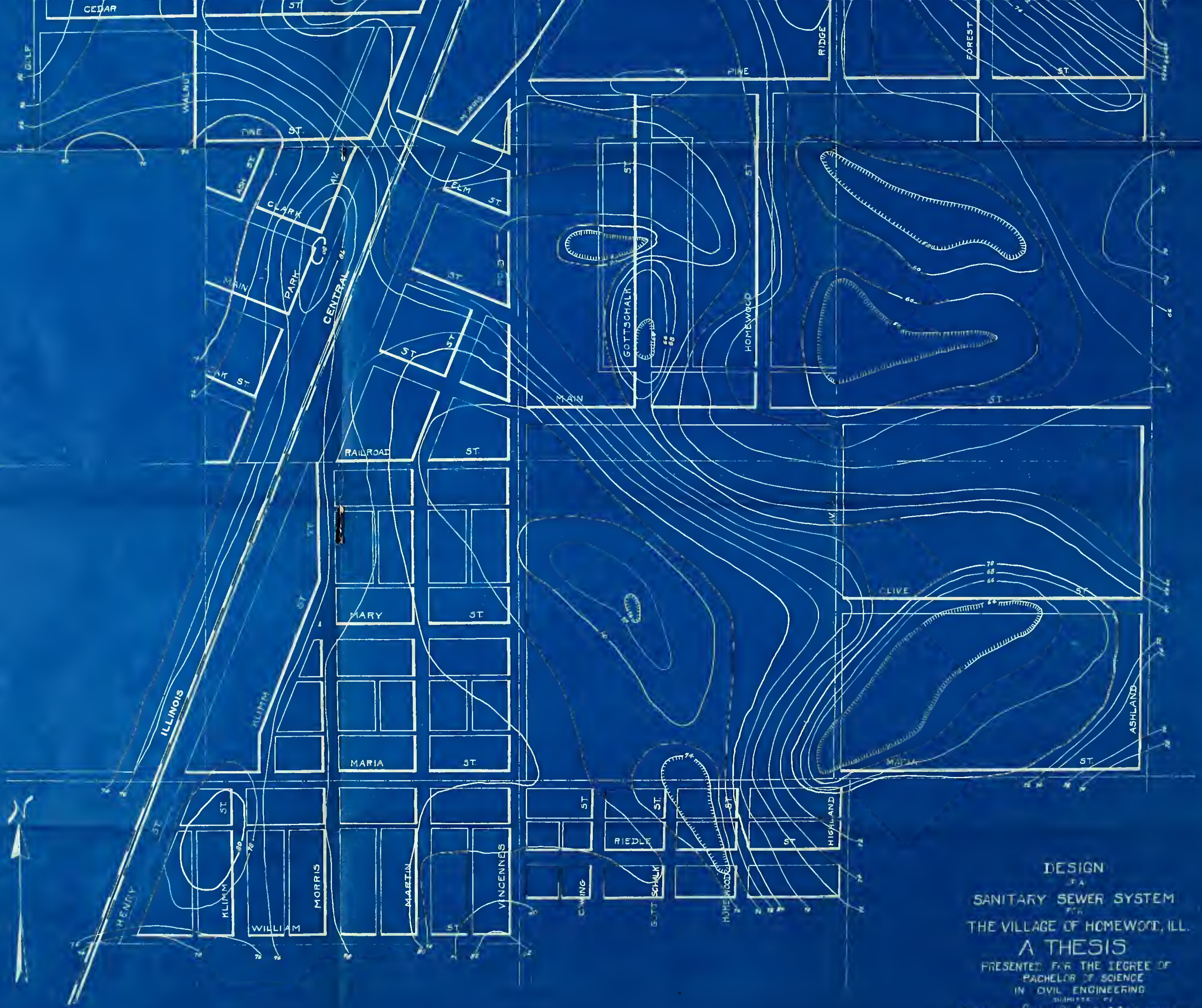
DATA PER UNIT TANK.
POPULATION 4000 (SANITARY SYSTEM)
300,000 U.S. GALLONS PER DAY
FLOWING-THRU TIME 3 HOURS
DETENTION PERIOD OF SLUDGE 1 YEAR

DESIGN
OF A
SANITARY SEWER SYSTEM
FOR
THE VILLAGE OF HOMEWOOD, ILL.
A THESIS
PRESENTED FOR THE DEGREE OF
BACHELOR OF SCIENCE
IN CIVIL ENGINEERING.
SUBMITTED BY
Emil Dessing Henry McGough E. L. Gale M. E. Nelson
ARMOUR INSTITUTE OF TECHNOLOGY
CHICAGO, ILL.
CIVIL ENGINEERING DEPARTMENT.
MAY 1912.

VILLAGE OF
HOMEWOOD
ILLINOIS.

SCALE 1"=200'





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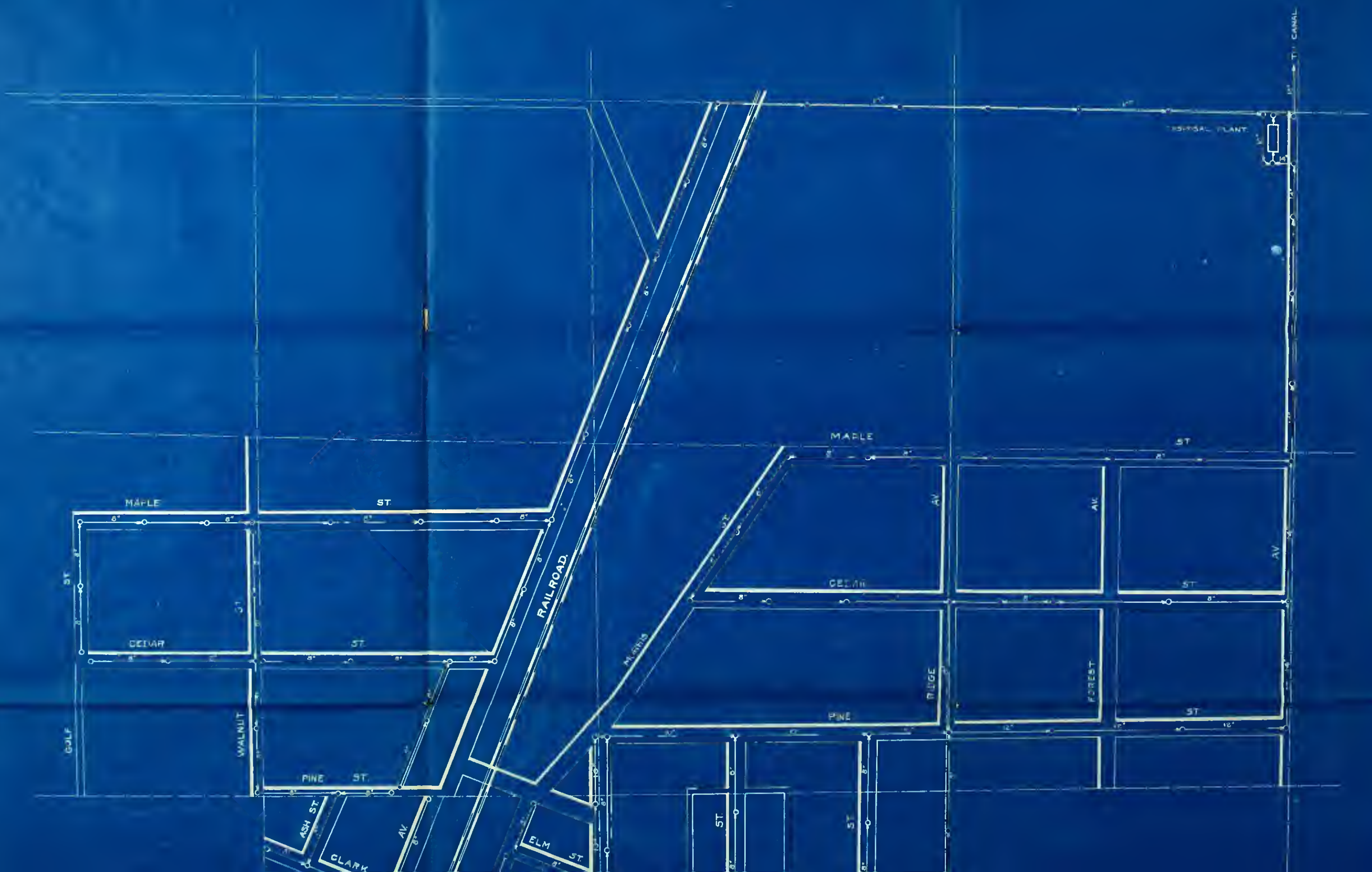
MAY 1918

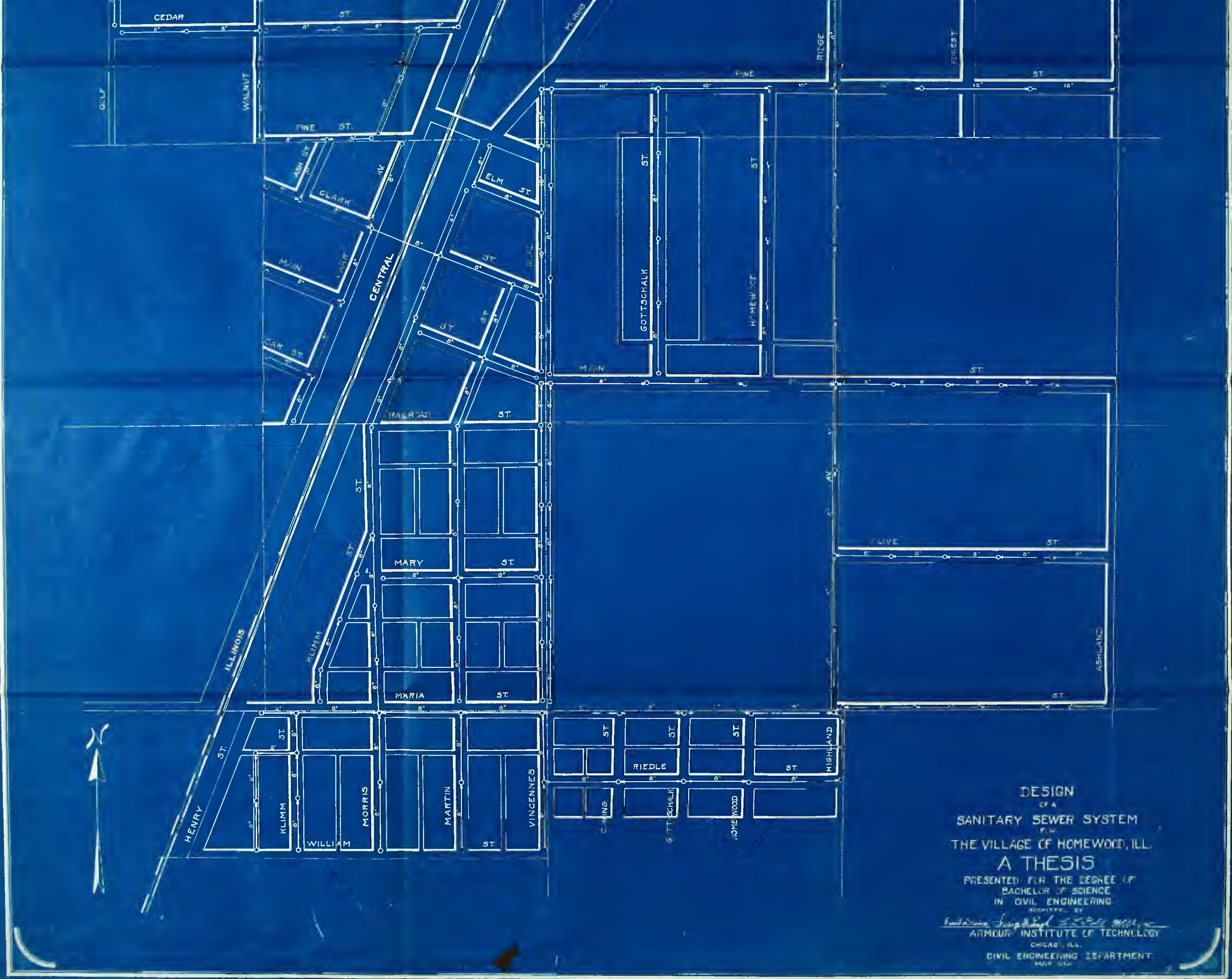
VILLAGE OF

HOMEWOOD

ILLINOIS.

SCALE 1"=200'





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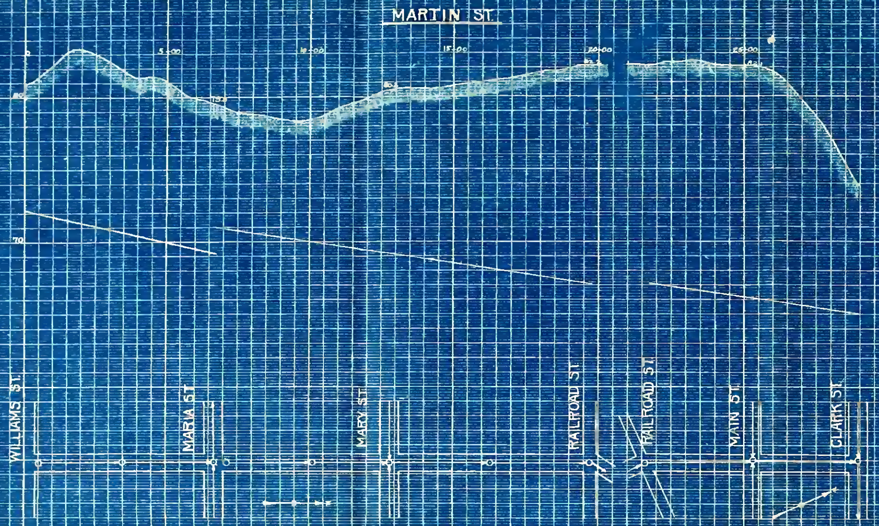
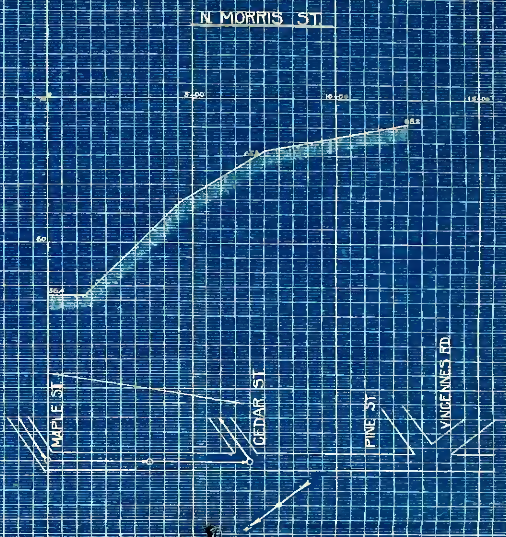
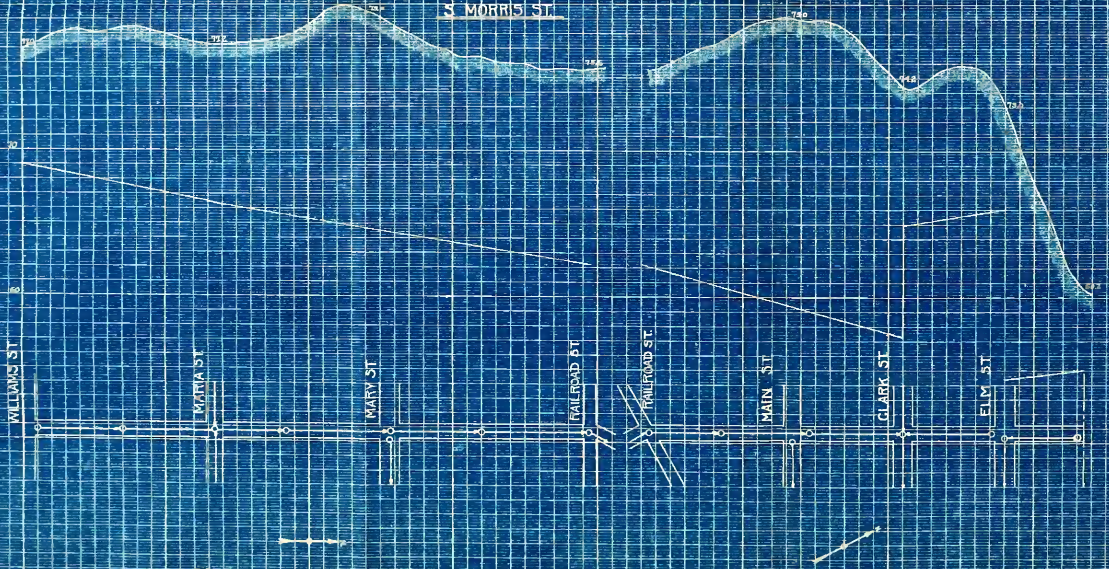
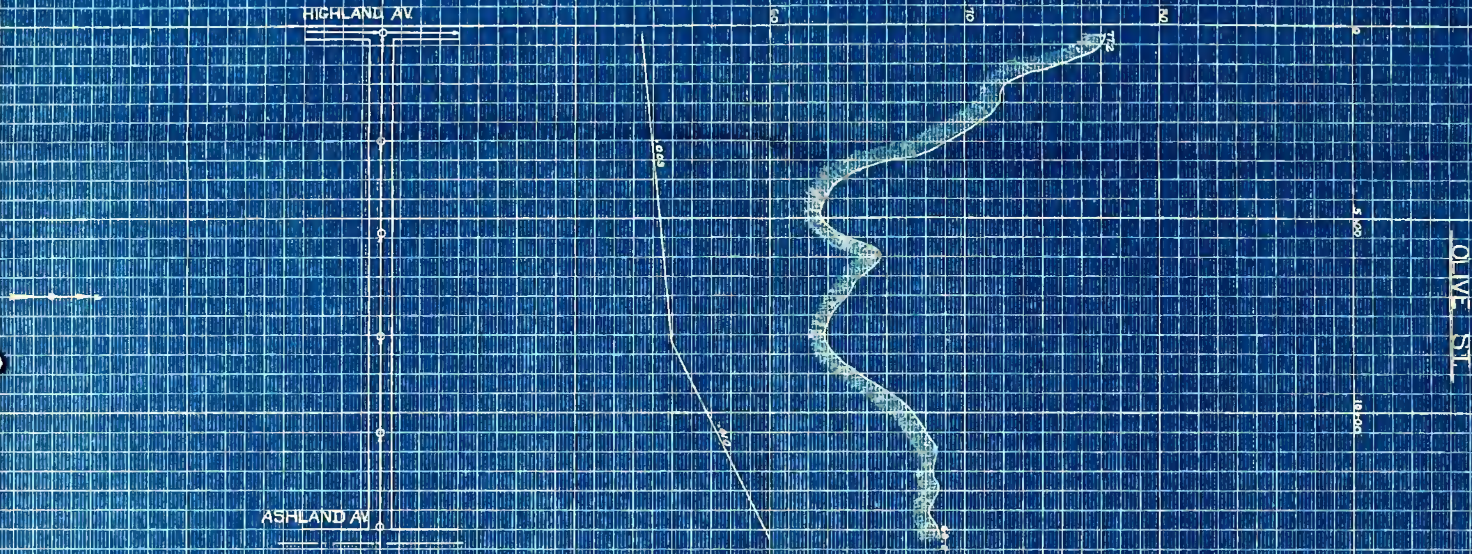


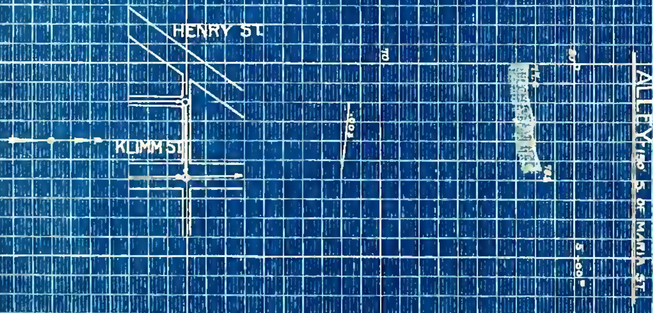




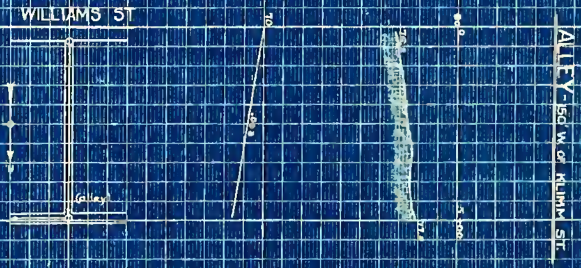
SCALE { VERTICAL – 1"–4'
HORIZONTAL 1"–200'



OLIVE ST.

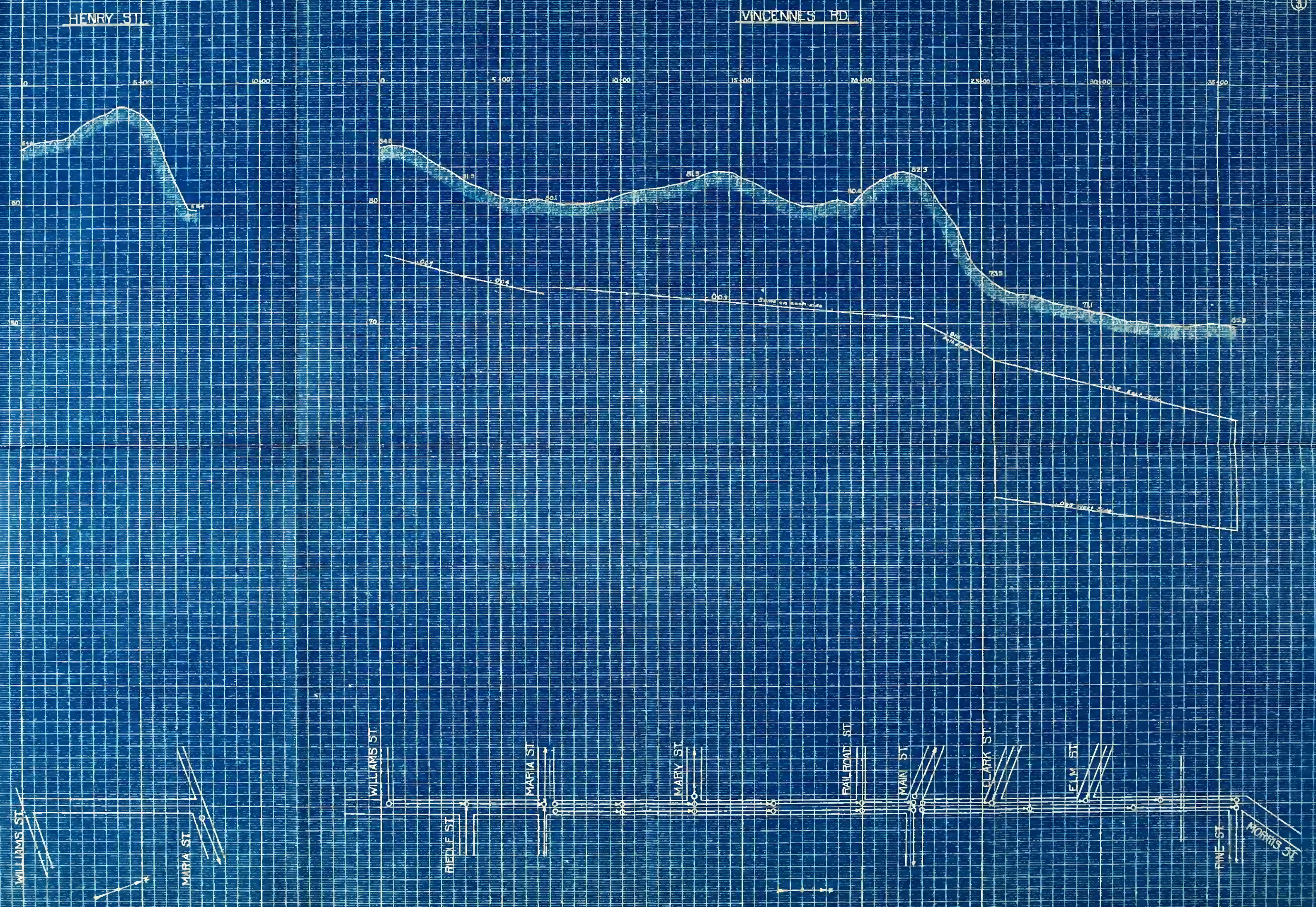


ALLEY 150' S. OF MARIA ST.



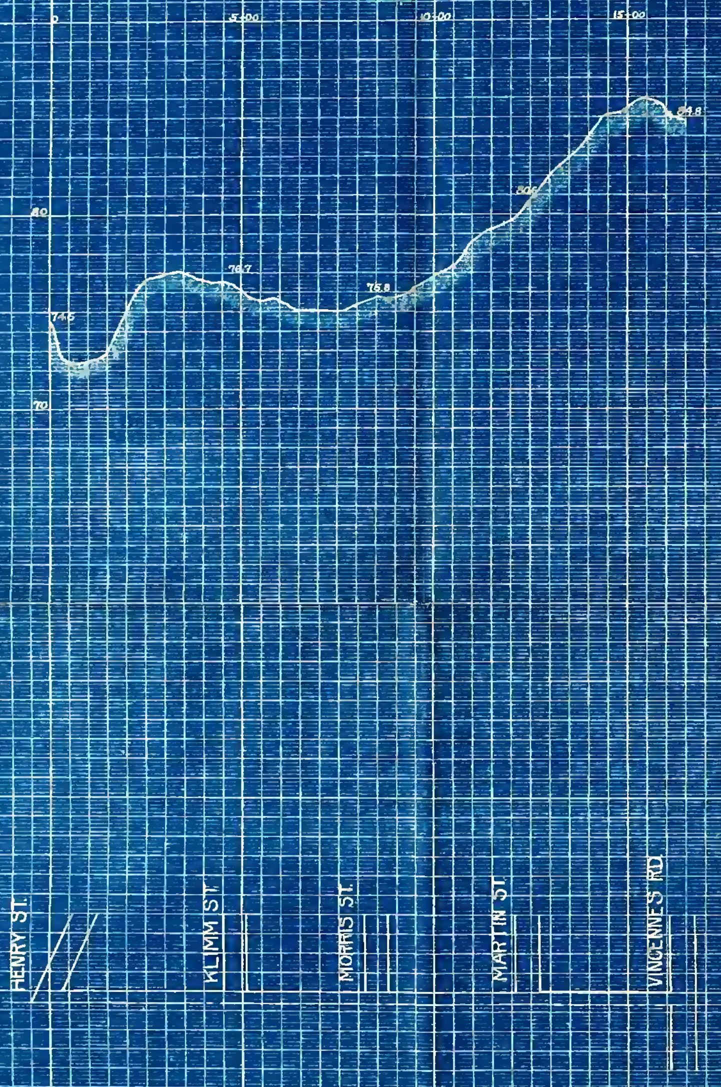
ALLEY 150' W. OF KLIMM ST.

③

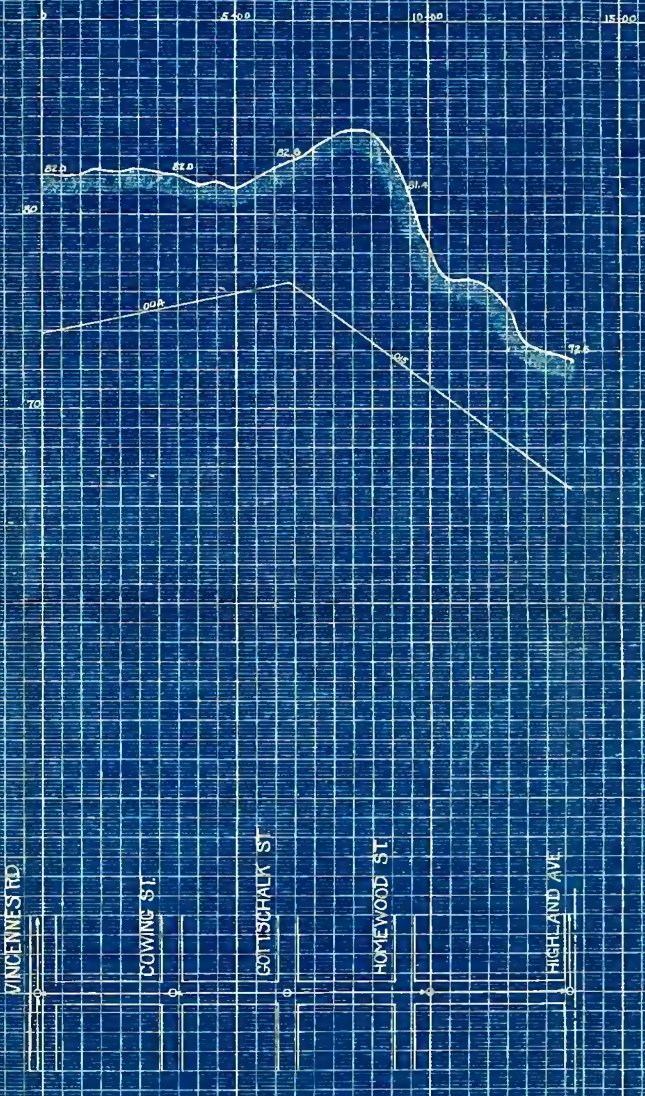

HENRY ST.
VINCENNES RD.
0
5+00
10+00
160
150
0
5+00
10+00
15+00
20+00
25+00
30+00
35+00
84.5
81.5
80.1
81.5
80.6
82.3
73.5
71.1
69.9
80
70
.004
.004
0.03
Same on each side
Old Kerb side
East side
West side
WILLIAMS ST.
MARIA ST.
WILLIAMS ST.
RIEDLE ST.
MARIA ST.
MARY ST.
RAILROAD ST.
MAIN ST.
CLARK ST.
ELM ST.
PINE ST.
MORRIS ST.

④

WILLIAMS ST.

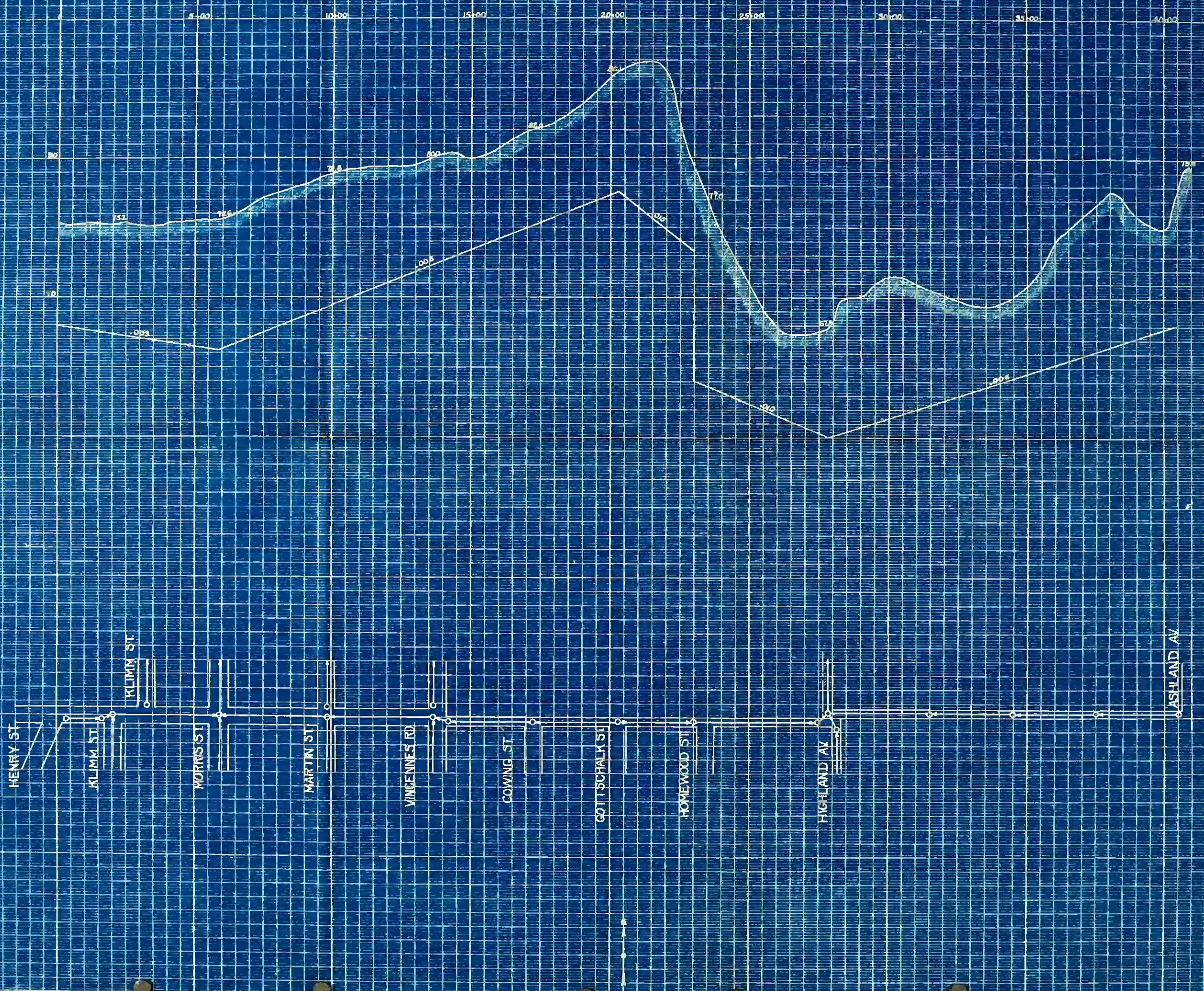


RIEDLE ST.



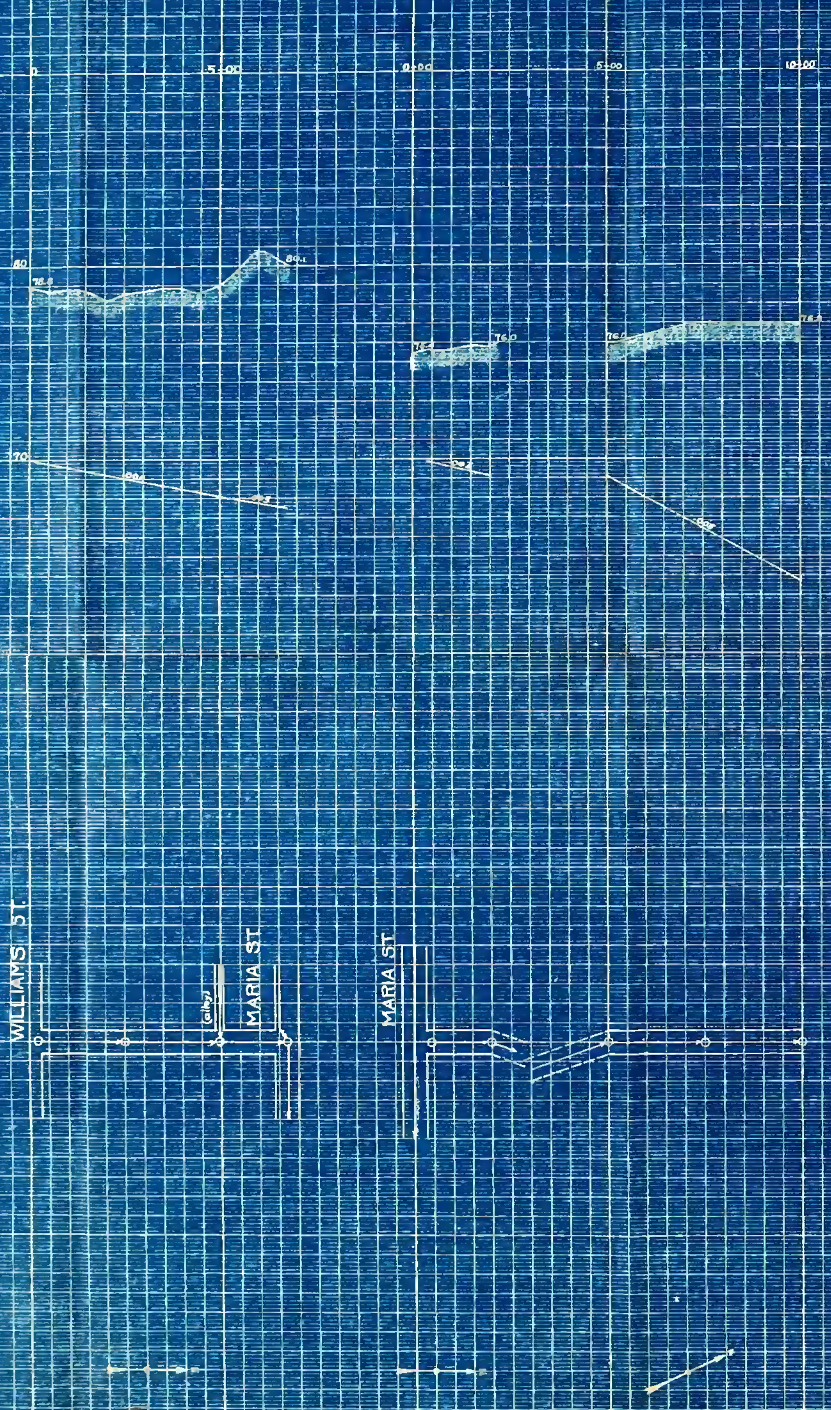
⑤

MARIA ST.

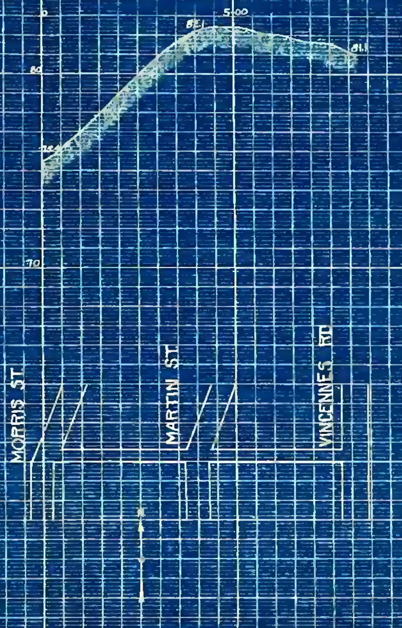


0
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
80
70
752
756
78.8
800
82.0
86.1
770
67.5
.003
.008
.015
.010
.006
HENRY ST.
KLIMM ST.
KLIMM ST.
MORRIS ST.
MARTIN ST.
VINCENNES RD.
COWING ST.
GOTTSCHALK ST.
HOMEWOOD ST.
HIGHLAND AV.
ASHLAND AV.

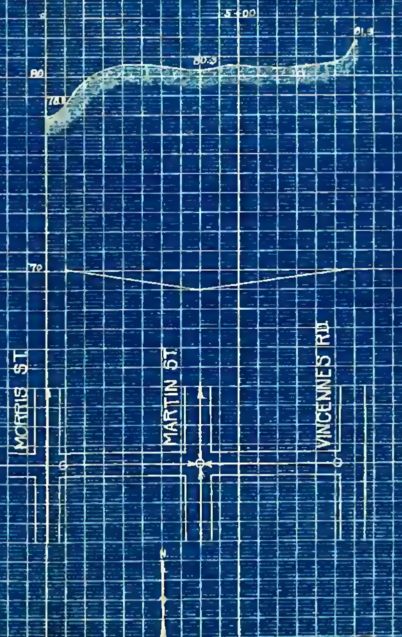
KLIMM ST



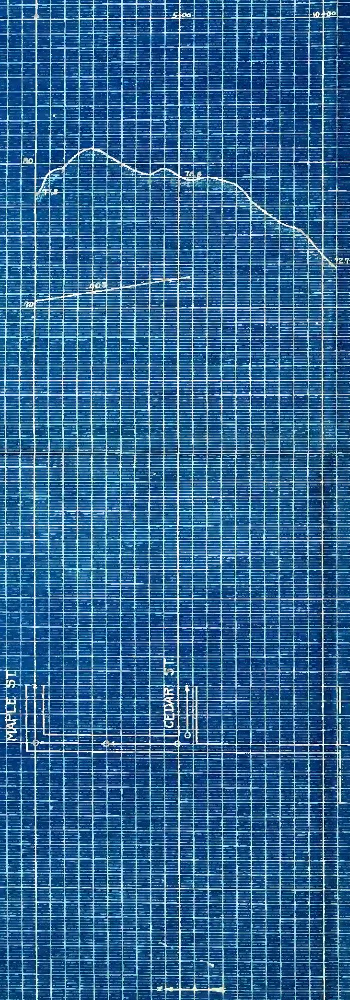
RAILROAD AVE.



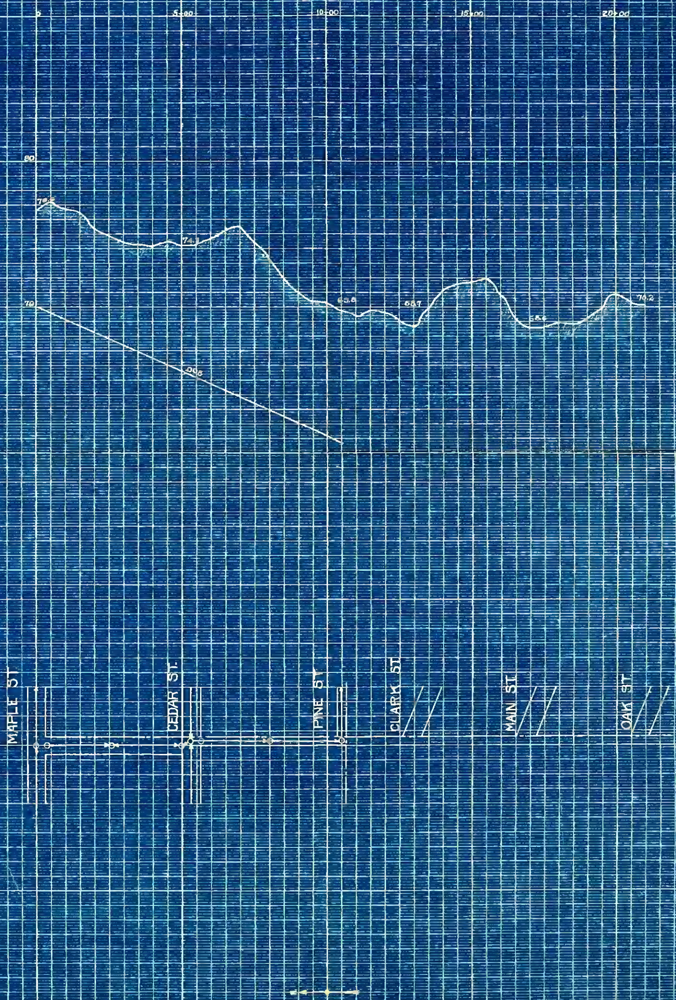
MARY ST

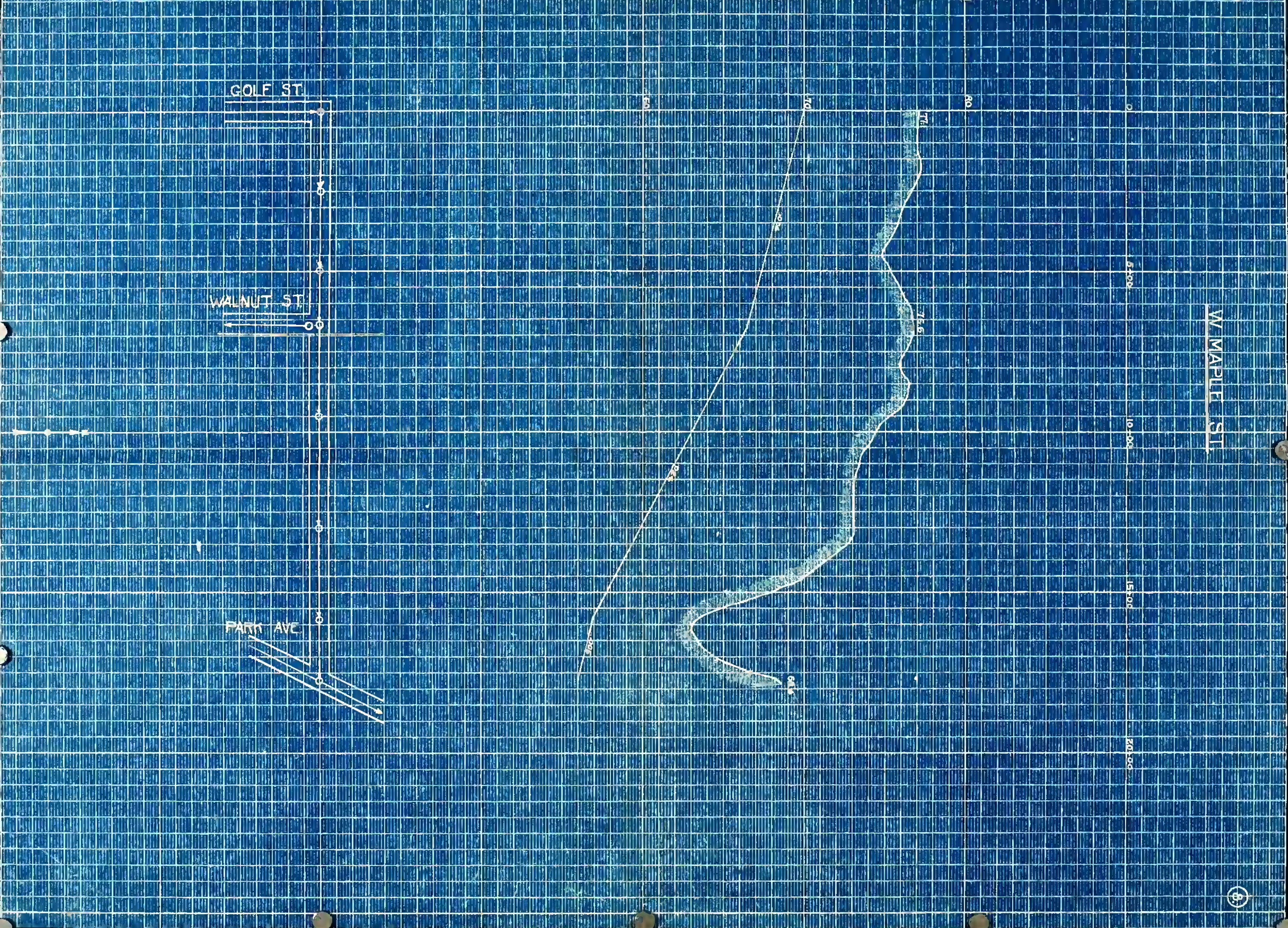


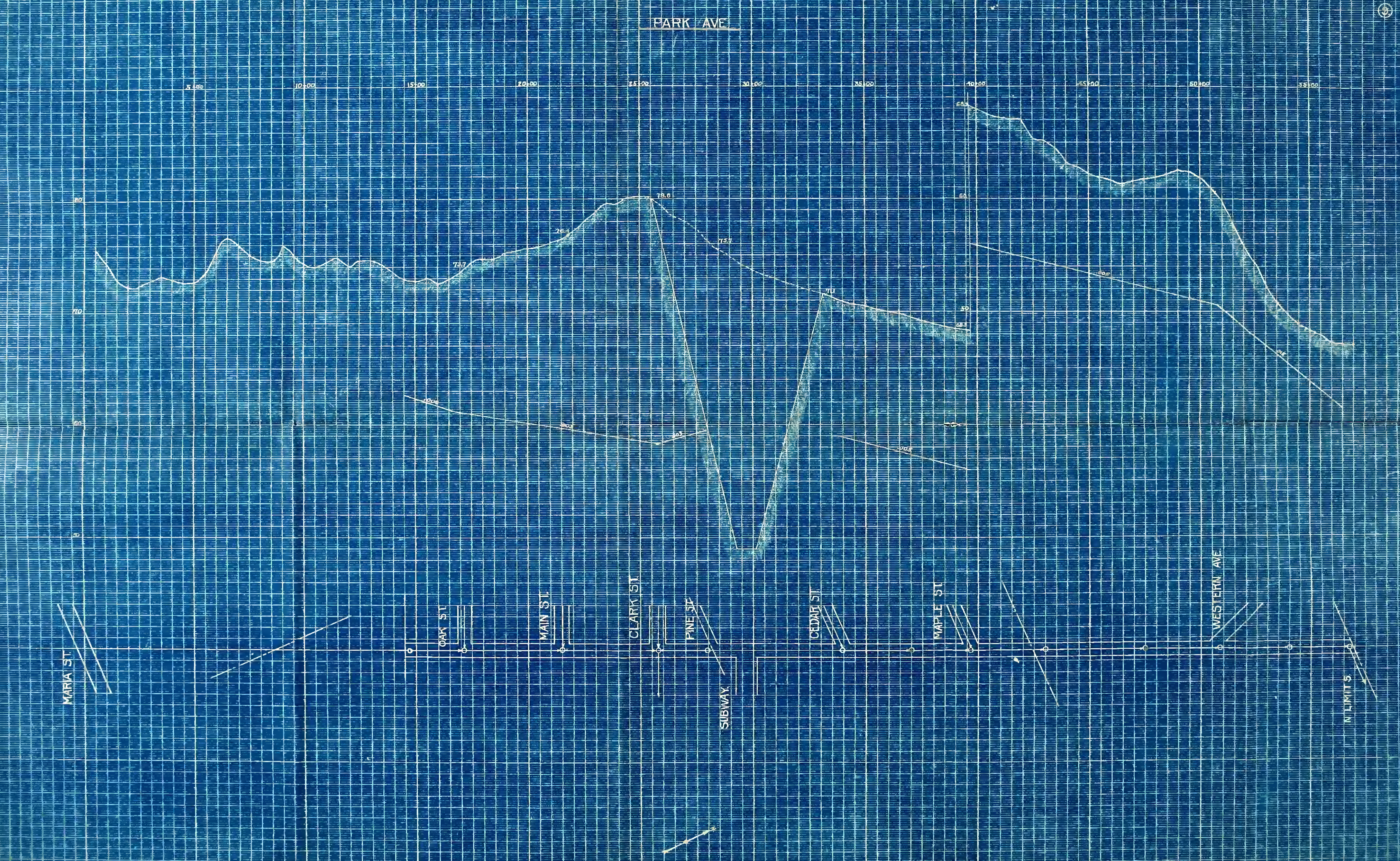
GOLF ST.



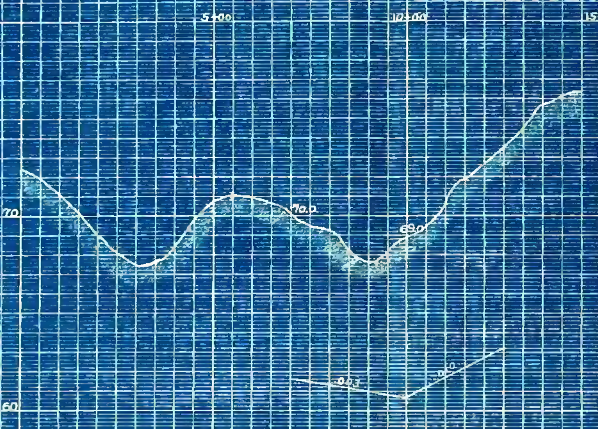
WALNUT ST.

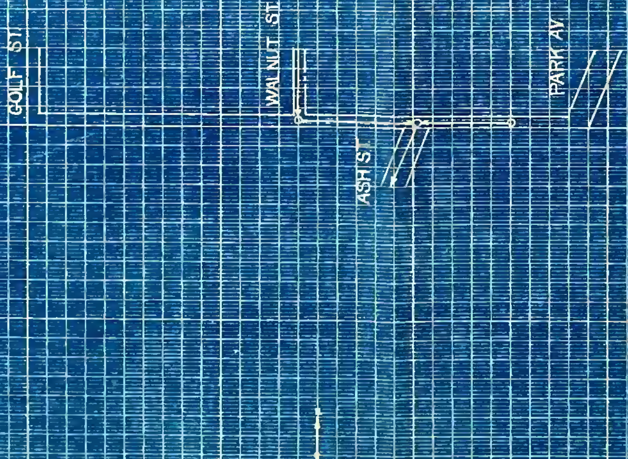



GOLF ST.
WALNUT ST.
PARK AVE.
W. MAPLE ST.
60
70
80
0
5+00
10+00
15+00
20+00
77
72.6
64
(6)

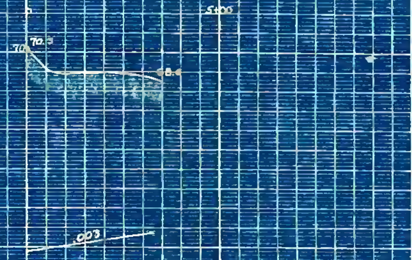

PARK AVE
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
45+00
50+00
55+00
80
70
60
50
78.6
76.4
73.7
75.7
70
68.5
MARIA ST.
OAK ST.
MAIN ST.
CLARK ST.
PINE ST.
SUBWAY
CEDAR ST.
MAPLE ST.
WESTERN AVE.
N. LIMITS

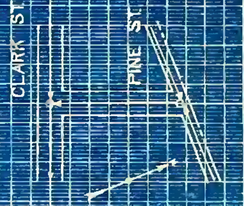
W. PINE ST.



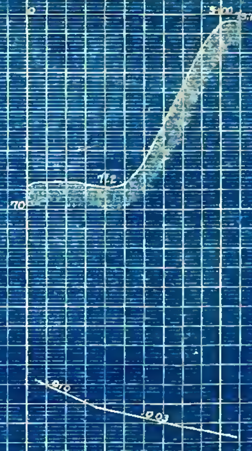


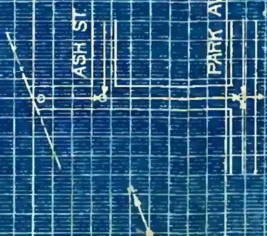
ASH ST.





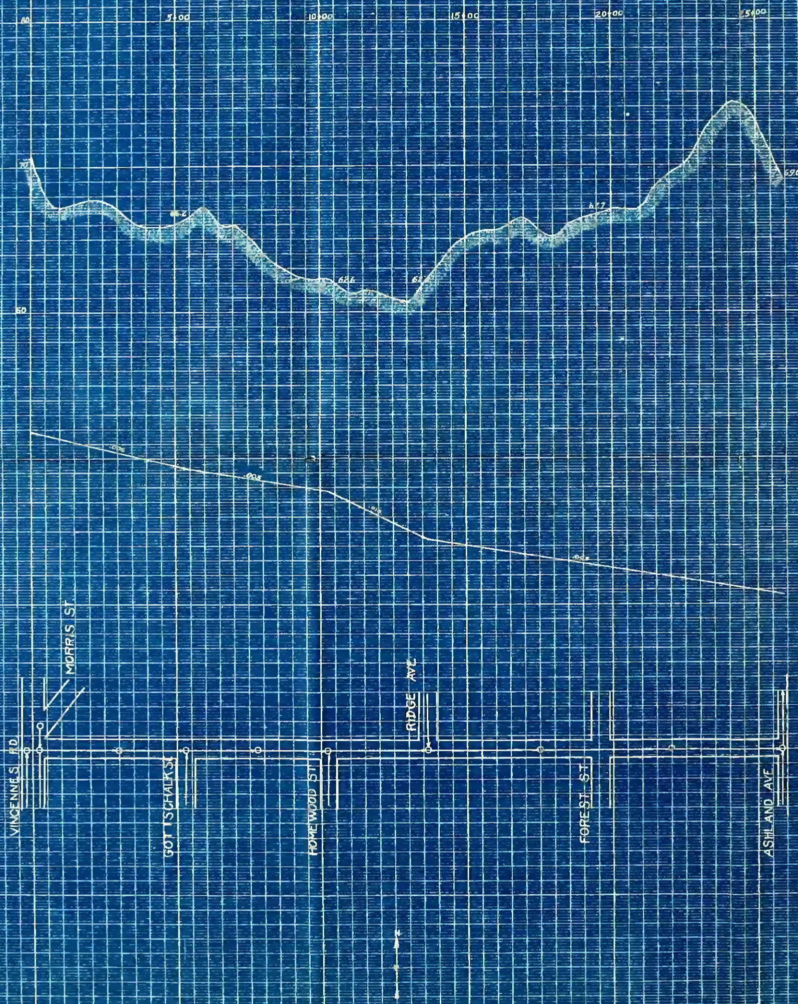
W. CLARK ST.



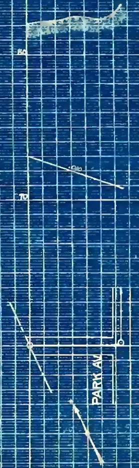


Ⓗ

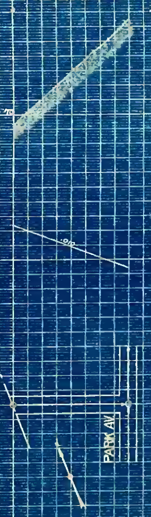
E. PINE ST.

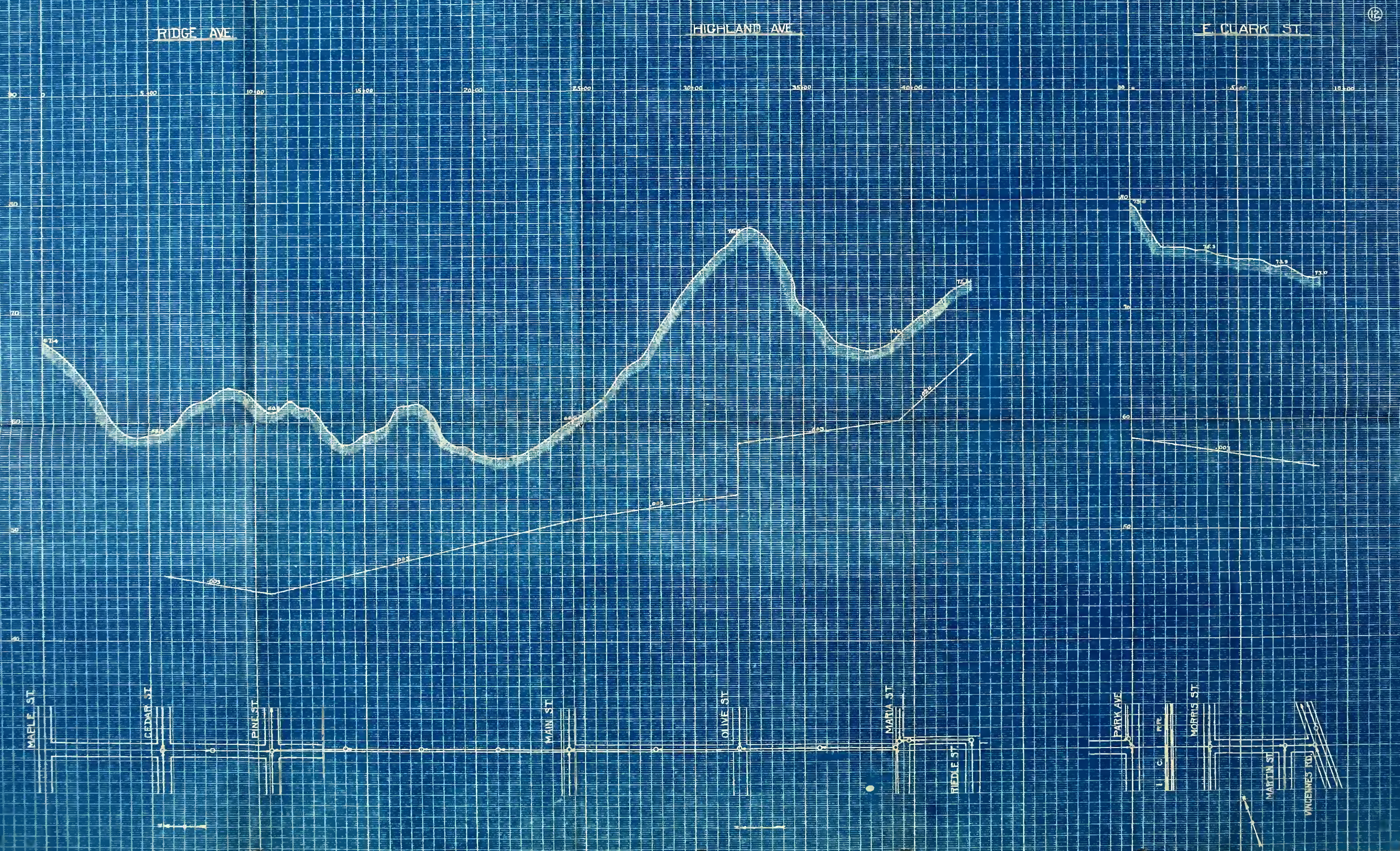


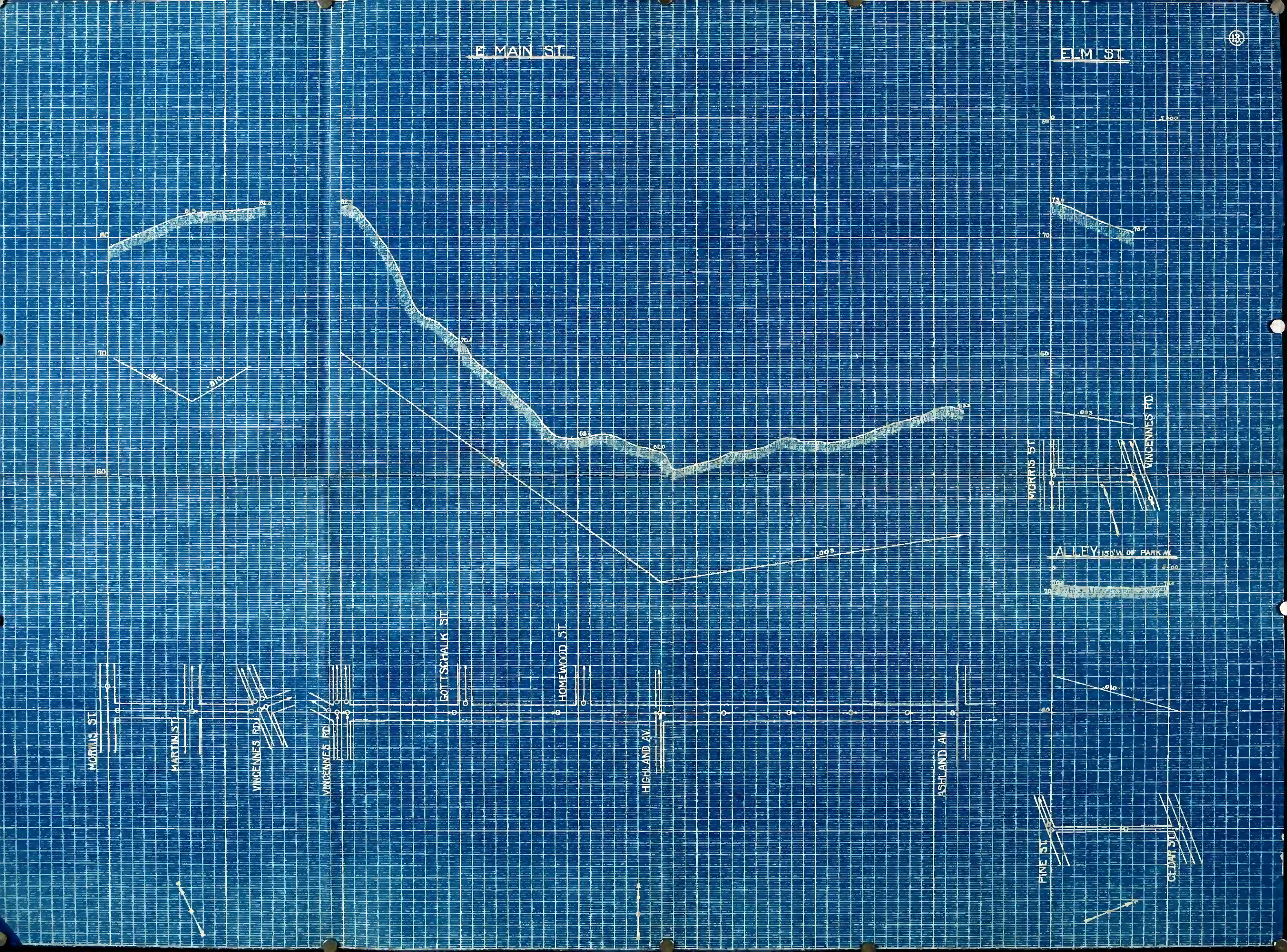
OAK ST.



W. MAIN ST.

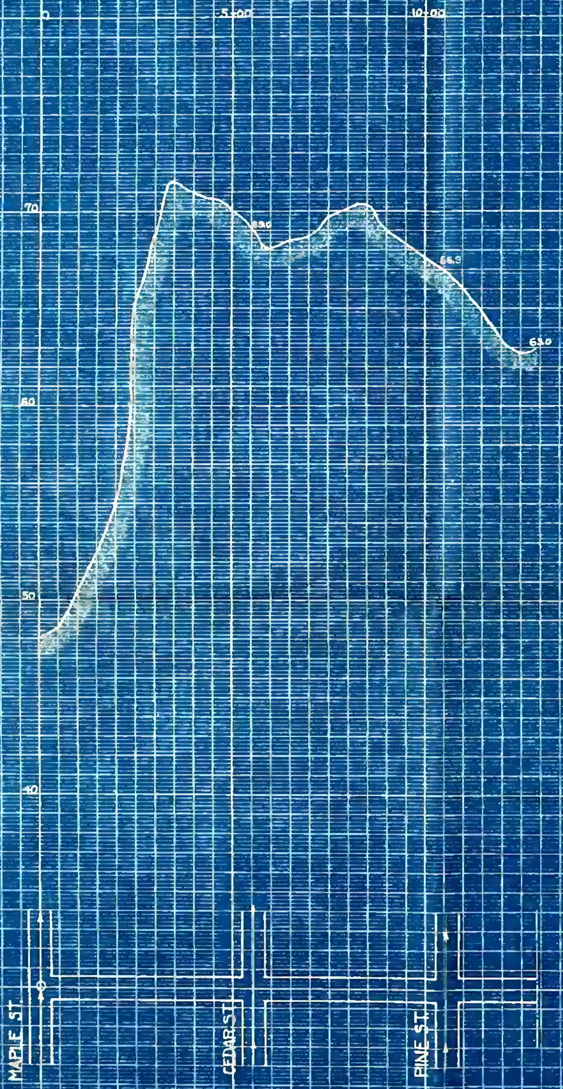



⑫
RIDGE AVE
HIGHLAND AVE
E. CLARK ST.
0
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
0
5+00
10+00
90
80
70
60
50
40
80
70
60
50
57.4
.005
.005
.005
.005
.020
72.4
78.6
76.3
73.9
73.0
.005
MAPLE ST.
CEDAR ST.
PINE ST.
MAIN ST.
OLIVE ST.
MARIA ST.
RIEDLE ST.
PARK AVE.
I. C. R.R.
MORRIS ST.
MARTIN ST.
VINCENNES RD.

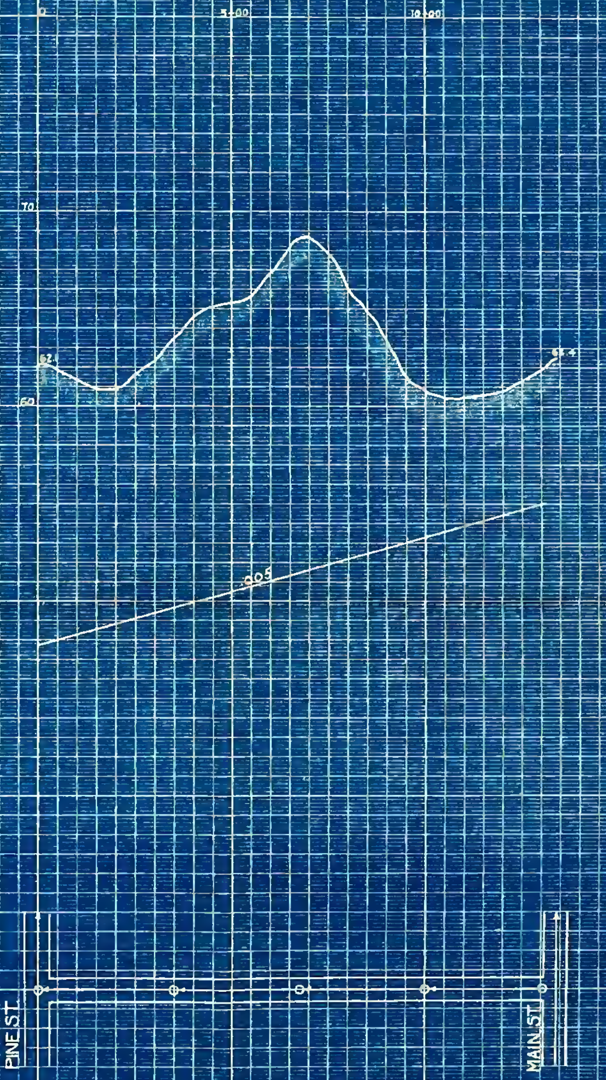

E. MAIN ST.
ELM ST.
80
70
60
.010
.010
.003
5+00
70
60
.003
.010
MORRIS ST.
VINCENNES RD.
ALLEY 150' W. OF PARK AV.
5+00
MORRIS ST.
MARTIN ST.
VINCENNES RD.
VINCENNES RD.
GOTTSCHALK ST.
HOMEWOOD ST.
HIGHLAND AV.
ASHLAND AV.
FINE ST.
CEDAR ST.

14

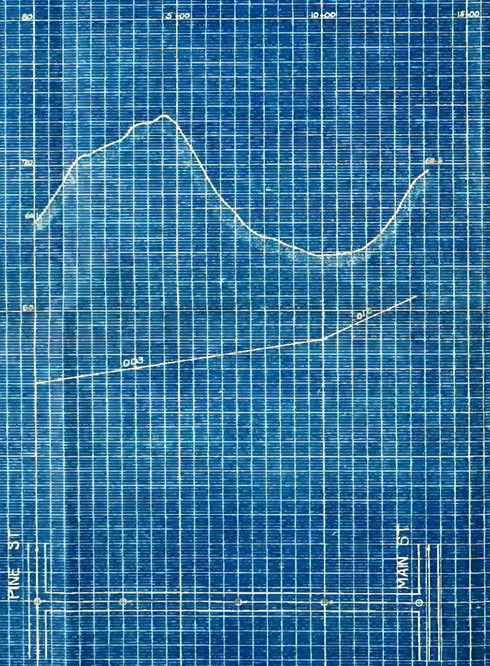
FOREST ST.



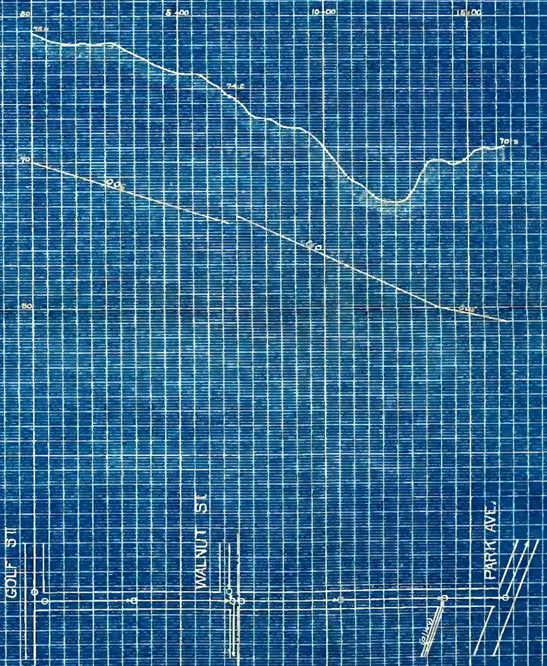
HOMEWOOD ST.



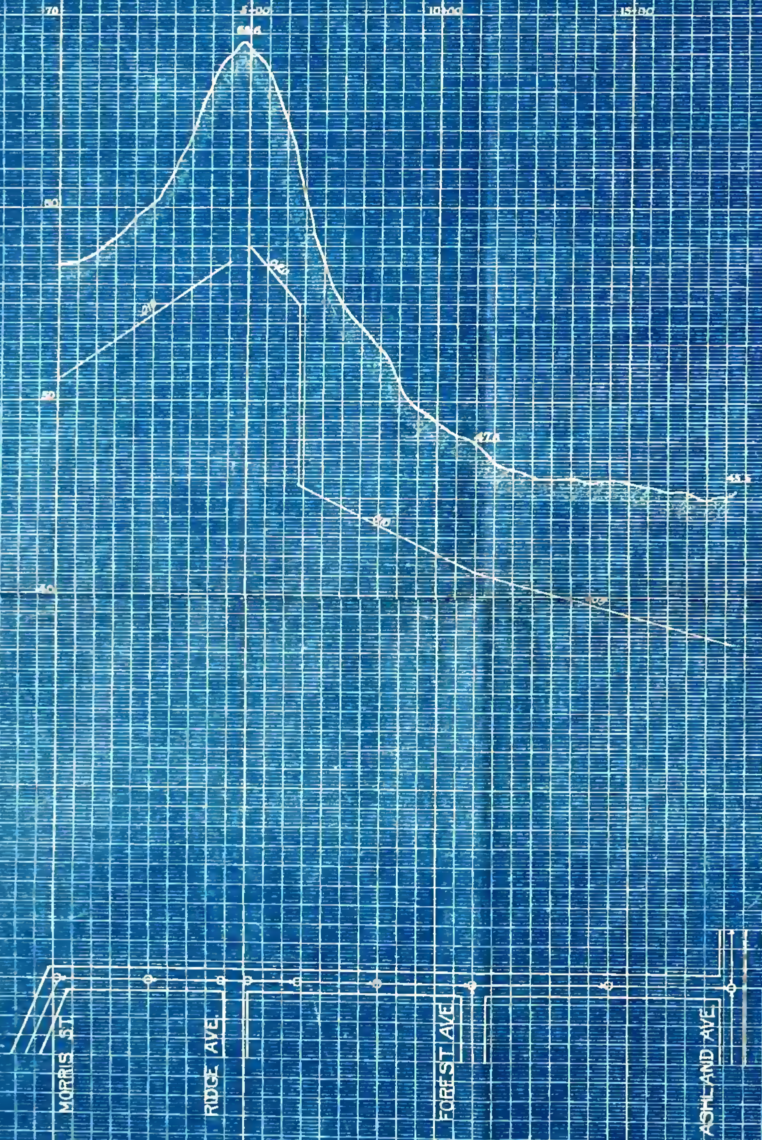
GOTTSCHALK ST.



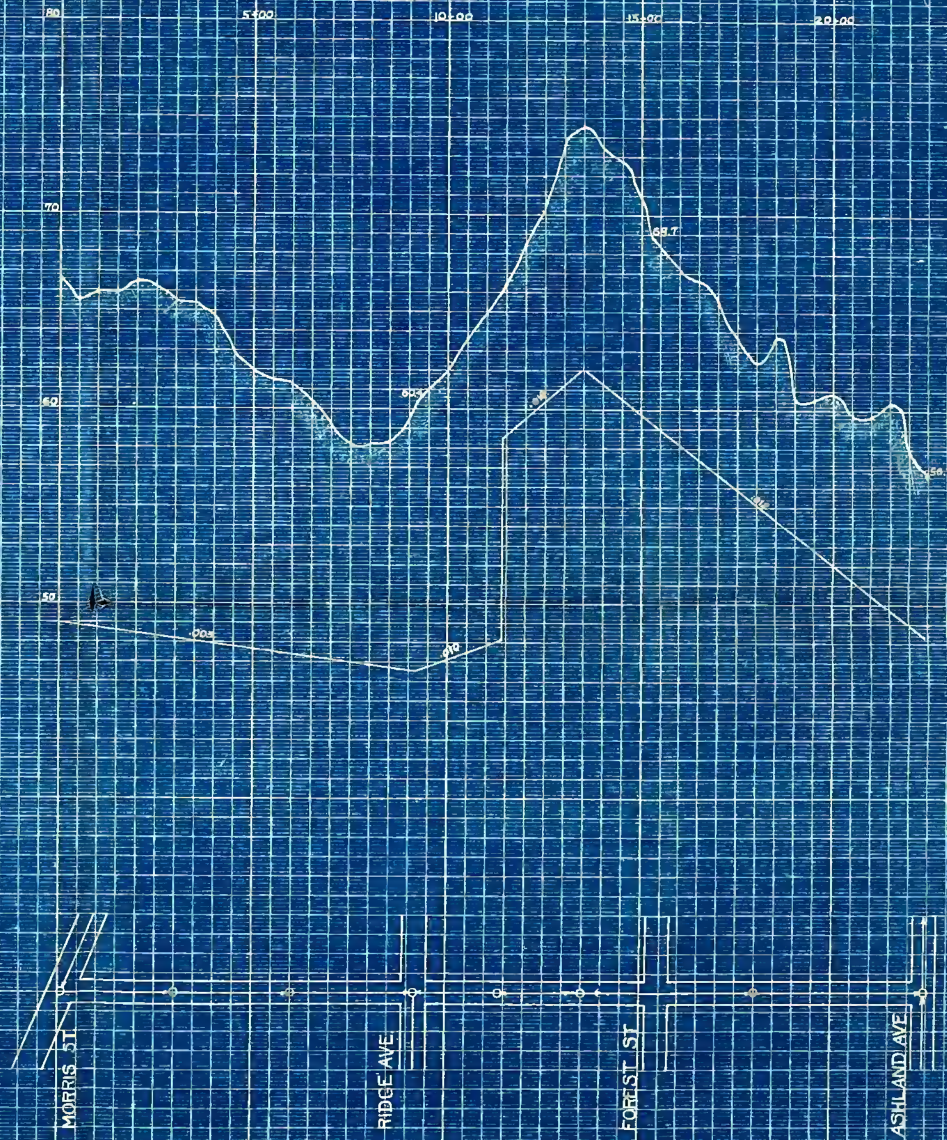
W. CEDAR ST.



E. MAPLE ST.

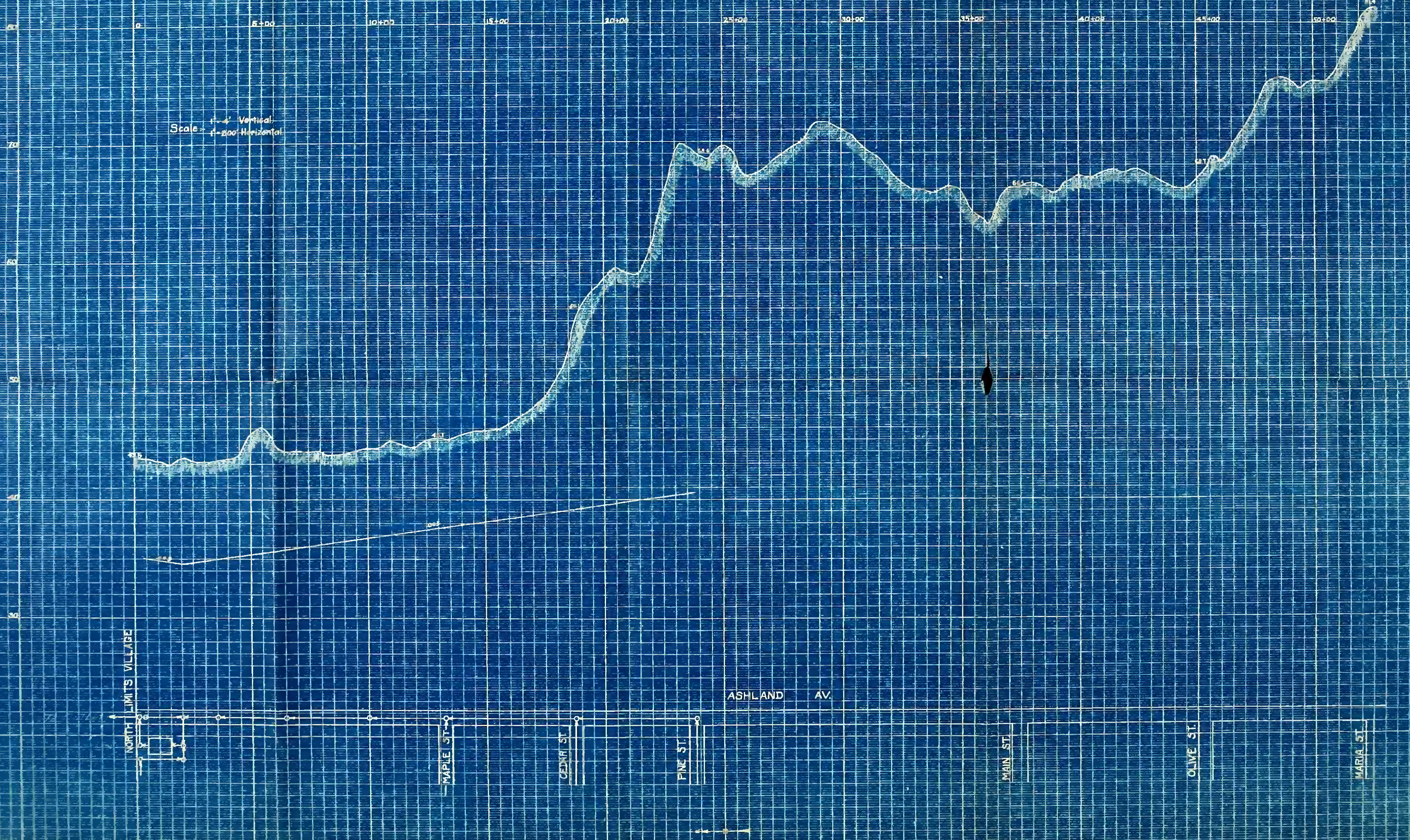


E. CEDAR ST.



⑰

ASHLAND AVE.



N. CITY LIMITS.